TAMING DISASTERS

A KEY TO EFFECTIVE DISASTER MANAGEMENT

ASRAR AYYUB

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"I have utilized this book in my Research Paper during National Management Course at National Management College Lahore and I can write it with full confidence that 'Taming Disasters' is a real key to effective Disaster Management".

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Principle Secretary to Chief Minister KP
Ex. Director General PDMA KP

* * *

"Mr. Asrar Ayyub has worked with Action Against Hunger as a Disaster Management Consultant for quite some time. He conducted many trainings and developed many documents for us to our utmost satisfaction. He has DRM knowledge that is rare in Pakistan".

Rangaiya Kanaganathan
WASH & DRM Coordinator
Action Against Hunger, Pakistan Mission

Taming Disasters

A Key to Effective Disaster Management

Asrar Ayyub

National Book Foundation
Islamabad

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Prologue

Not very long ago the world converged to develop the Hyogo Framework of Action 2005-2015 followed by the Sendai Framework 2015-2025; both global blueprints for disaster risk reduction efforts. These frameworks encourage the culturalization of disaster risk management at all levels; including the incorporation of disaster management education in the curricula of schools and institutes of higher education.

Even as researchers delve deeper to the science of disaster management, constructing theories and models, the absence of simple guidebooks for the layman means that precious time is being lost and precious lives are being endangered as people remain unaware of and unprepared for the disasters they might encounter.

There is a real dearth of simple Disaster Management books suitable for instruction purposes in Pakistan as well as elsewhere in the world. It is in this very context that the National Book Foundation has had the good fortune of commissioning the publication of this book “Taming Disasters: A Key to Effective Disaster Management” by renowned DRM expert, teacher, trainer and consultant, Mr. Asrar Ayyub. Herein are the fundamentals of disaster management translated into actionable guidelines. Inspired by Victor Hugo, who once said, “you cannot resist an idea whose time has come”, it is my proud privilege to present to you this timely guidance for our generation and many to come, in the hope that it will make this world a safer place and our people more resilient.

Prof. Dr. Inam ul Haq Javeid
(Pride of Performance)
Managing Director

Dear Readers

Life is the greatest gift and protecting it is our greatest duty.

Life, from the very beginning is at risk from natural and man-made hazards and the human being, right from birth, tries to prevent hazards from becoming disasters.

Disaster management is the mother of all sciences. We owe all of human development to the science of disaster management, whether in its crude or refined state.

I have learned the Alphabets of Effective Disaster Management from my extensive labor as a disaster management student, teacher, practitioner, trainer and consultant. I have all the reasons to believe that Disaster Management is the key to ultimate peace and prosperity.

The world has no option but to promote a global culture of Disaster Management by incorporating it as a compulsory subject in the curriculum of schools regardless of where they are, and irrespective of religion, ethnicity and other factors.

We must follow universally agreed upon international frameworks, to be proactive (rather than reactive) in our attitude towards disasters. Let's work together to save mother earth and its inhabitants from mass extinction.

Thanks
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Risk is compulsory; Loss is optional

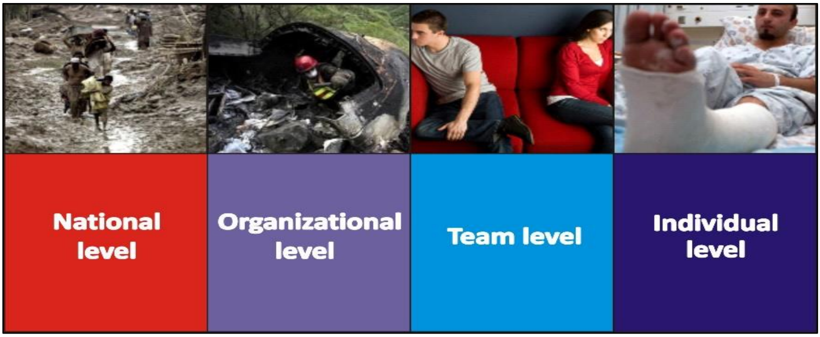
What is a Disaster?

In simple words, a disaster is the damage done to you, your belongings or environment which cannot be managed without external help.

In classified terms a disaster is the actualization of risk beyond capacity.

Scope of a Disaster

There are four levels of a disaster;



Examples

1. The 2005 Kashmir Earthquake (A national disaster)

The earthquake occurred at 08:50:39 Pakistan Standard Time on 8th October in the Kashmir region of South Asia. It was centered in Pakistan-administered Kashmir, near the city of Muzaffarabad, and it also affected Pakistan's Khyber Pakhtunkhwa province. The earthquake registered a magnitude of 7.6 on the Richter Scale and had a maximum Mercalli Intensity of VIII (severe). 73,338 people died and 128,304 were injured; 600,000 houses were destroyed, and 3.5 million people were rendered homeless. (Wikipedia).

The 2005 Kashmir Earthquake was a national disaster because the country was incapacitated to manage it from within its own resources and international help was sought.

2. Bhoja Air Crash (An organizational disaster)

On 20th April 2012, the Boeing 737 236 aircraft, flying from Karachi, crashed in bad weather during its approach to Benazir Bhutto International Airport, Islamabad. All 121 passengers and 6 crew members aboard were killed in the crash. This was the inaugural flight of Bhoja Air's second daily service on this route. (Wikipedia).

This was an organizational disaster because the airline was incapacitated to manage it from within its own resources, although, the country was not.

3. A Famous Divorce Case (A team disaster)

With Heather Mills, Sir Paul McCartney seemed to have found happiness after the death of his first wife, but after four years together Mills went on to attack McCartney calling him abusive and violent, as well as a drug abuser. The British press came to Sir Paul's defense and labeled Mills a characterless gold-digger. The couple headed to divorce court in 2006. (Wikipedia).

This was a disaster on a team level because husband and wife failed to manage it on their own and had to seek external help.

4. **Study Loan Defaulters of Malaysia (An individual disaster)**

EDUCATION NOT FOR SALE
ABOLISH PTPTN
43 bil
PM
PTPTN PERBADANAN TABUNG PENDIDIKAN TINGGI NASIONAL

In 2014 almost 85,000 recipients of low-interest student loans from the government's National Higher Education Fund Corporation faced departure bans because of loan arrears. With the cost of university education rising faster than inflation and increasing sums taken out in loans, more and more students were defaulting on their loan repayments. (Wikipedia).

This was a disaster on an individual level as the students required external help to pay off the loans.

What is Risk?

It is the probability or threat of harmful consequences to you, your belongings or environment.

Risk, in fact, is the product of hazard and vulnerability and being a quantifiable term is represented by the following equation;

Risk = Hazard * Vulnerability

What is Hazard and Vulnerability?

Anything that has the potential of causing loss is a hazard and your susceptibility to it is vulnerability.

Examples

1. Electric current is a hazard and an electrician doing some repair work on a transmission line without plastic gloves on his hands is vulnerable to it.

2. A person riding a motorbike without putting on a helmet is vulnerable to the hazard of a concrete road.
3. Cold is a hazard to which infants are more vulnerable than adults.
4. Examination is a hazard and those who do not prepare, are more vulnerable to it than those who prepare.
5. A boss at the office is a hazard and those who do not obey his orders are vulnerable to him.

Types of Hazard

There are two types of hazards

1. Natural: Earthquakes, Floods, Droughts, Cyclones, Landslides, Avalanches, etc.
2. Human Induced: Terrorism, Corruption, Poverty, Violation of Merit, Lawlessness, Deforestation, Industrial Carbon Emissions, etc.

Types of Vulnerability

- Social
- Environmental
- Physical
- Attitudinal
- Financial
- Educational

Social Vulnerability

"Social" refers to collective coexistence and our interaction with fellow beings irrespective of whether the interaction is voluntary or involuntary.

The more tolerant, respectful, logical, just and equitable, progressive, systematic and law-abiding people are to each other in their social life, the more they are united and the lower is their social vulnerability. The more people are divided, the greater is their social vulnerability.

In a socially vulnerable community people are discriminated against on the basis of religion, ethnicity, language, financial status, etc.

The famous technique of "Divide and Rule" to subjugate the majority, actually entails making a community socially vulnerable. The universally acknowledged elements of this method include:

- Creating or encouraging divisions among the subjects to prevent alliances that could challenge the sovereign
- Aiding and promoting those who are willing to cooperate with the sovereign
- Fostering distrust and enmity between local rulers
- Encouraging meaningless expenditures that reduce the capability for meaningful spending

The strategy of "Divide and Rule" to make communities socially vulnerable to the hazard of "foreign occupation" was employed by most imperial powers in their colonies. For instance in the Indian subcontinent, the British and French supported the local leadership in their conflicts with each other so that millions could be ruled by thousands.

The time-tested, ancient Greek phrase, translated into English as "united we stand, divided we fall" in fact, means that socially vulnerable communities cannot withstand the hazards they are exposed to. The phrase was also commonly used in India to gather political strength during the struggle for independence from the British Empire.

Each and every religion that has descended upon human beings preaches to be united under the universally acknowledged principle of "love your fellow beings, as you love yourself".

Societies divided into casts, sects, races and other groups are socially vulnerable and can easily be victimized by various hazards.

Attitudinal Vulnerability

Attitude is the tendency to respond positively or negatively towards a person, place, thing or event. Attitude has three components:

- Affective Component: This involves your feelings/ emotions about an attitude object. For example "I fear dogs".
- Cognitive Component: This refers to your belief/thought about an attitude object. For example "I believe dogs are dangerous".
- Behavioral Component: This refers to your actions resulting from your emotions and beliefs. For example "I keep away from dogs".

In simple words attitude is how you feel, believe and act under the circumstances, to respond positively or negatively towards a person, place, thing or event.

A negative response, for instance, could be that you are scared of disasters; you believe that you cannot escape the wrath of disasters as they are a heavenly curse for the sins of man, so you do nothing but ask for forgiveness from God.

A positive response, for instance, could be that you are not scared of disasters; you believe that risk is compulsory and loss is optional, so you learn how to manage disasters and prepare to take them on. The greater the tendency to respond positively, the lesser the Attitudinal Vulnerability to hazards; and, the greater the tendency to respond negatively, the greater the Attitudinal Vulnerability to hazards.

Attitude is correlated to stress which is a biological response to a stimulus that disturbs your mental and physical equilibrium. For example, you are taken aback by an earthquake which causes a physical and mental imbalance in you. As a consequence of this stress, the natural response of your body to this stimulus will be to either fight the situation or take flight from it. When stressed our bodies release chemicals into the bloodstream which provide more energy and strength for better possibility of survival under dangerous circumstances. But prolonged stress (resulting from a situation where neither fight nor flight is possible) transforms into a disorder which is commonly known as "Post Traumatic Stress Disorder" (PTSD). Some of the symptoms of PTSD are:

- Depression and hopelessness
- Loss of interest in day to day activities
- Feeling alienated and alone
- Sense of limited future (you don't expect to live a normal life)
- Irritability and outbursts of anger
- Physical aches and pains
- Feeling of mistrust and betrayal
- Difficulty concentrating
- Hyper vigilance (always on guard of danger/on constant "red alert")

(www.helpguide.org)

High levels of stress disorder account for greater Attitudinal Vulnerability.

Environmental Vulnerability

Environment is the sum total of all your surroundings including forces of nature and living organisms, which provide conditions for development and growth as well as danger and damage.

The more the environment is conducive for development and growth, rather than danger and damage, the lesser the environmental vulnerability.

For example, the island of Haiti suffers from one of the highest rates of deforestation which makes its environmental vulnerability very high. The loss of almost all its trees makes it a victim of frequent natural disasters. Even the damage done by the great earthquake of 2010 is believed to have been caused by excessive deforestation; the mountains lacked slope stabilization and fell victim to landslides in the aftermath of the earthquake.

On the contrary, the Dominican Republic, though situated on the same island, does not share the same fate because of its lush green forests.

(www.csmonitor.com)

Similarly, the damage done to Pakistan by the great earthquake of 2005 was worsened by the deforestation of steep mountain slopes. Landslides took many lives and a number of deaths could have been avoided by maintaining and restoring natural forest cover in earthquake zones prone to landslides.

Environmental vulnerability is equally important for manmade disasters as well. For instance, in the words of Godswill Lyoke "if you go to the Niger Delta, you have the mangrove swamp, the rain forest; there are trees and crops that grow there because the environment is conducive for them. Now why is the Nigerian society so corruption friendly? Corruption is endemic in Nigeria because the environment is conducive for it to thrive. It is a hydra headed problem and is no doubt the harbinger of the issues that put Nigerians where they are today".

Financial Vulnerability

This pertains to monetary receipts and expenditures. Financial vulnerability increases as expenses exceed income.

According to the World Meteorological Organization about 95% of the deaths caused by natural disasters occur in poor countries. A disaster of similar nature can cause very dissimilar results in different countries because of the variation in their financial vulnerability. For instance, both the Kobe (Japan) earthquake of 1995 and the Haiti earthquake of 2010 measured 7.0 on the Richter scale, but only 6,000 people died in Kobe compared to a staggering 200,000 in Haiti. Unlike the Japanese, the Haitians had to worry more about basic necessities of life relegating the implementation of building codes and utilization of appropriate materials for construction to a backburner.

Physical Vulnerability

This pertains to material and physical characteristics including one's physique as well as the structures man inhabits and uses i.e. your body, buildings, roads, bridges, etc.

Physical impairment and weakness are directly proportional to physical vulnerability. For example, persons with disabilities are at greater risk from hazards than able people. Similarly, structurally mitigated buildings are less vulnerable to hazards than buildings for which appropriate designs and materials have not been used. For instance, after the earthquake of 2005 that struck Azad Jammu and Kashmir and Khyber Pakhtunkhwa (Pakistan) the damage done to physically vulnerable mud houses was far more than to properly constructed houses.

Educational Vulnerability

A people are educationally vulnerable when their curriculum does not correspond to their current needs.

The purpose of education is to groom children to be useful citizens and help the state attain its objectives. Therefore, education in the ancient Greek states of Sparta and Athens was different because they pursued different priorities. Spartans were warlords and the aim of education in Sparta was to produce good soldiers who were "obedient to the word of command; capable of enduring hardships; and, securing victories in battle". Even girls learned to be warriors; they could wrestle and handle weapons just as well as boys. In Sparta, those who knew the art of warfare were considered educated people. On the contrary, in Athens the goal of education was to produce good citizens. Being the pioneer of democracy, the state focused more on social values. Children learned poetry and music, science and math, debate and persuasive speech, etc. An educated person was one who knew how to live in a civilized manner.

(www.greece.mrdonn.org)
(www.cpp.edu)

The Spartans, being warlords, would have been educationally vulnerable if they had focused their attention on promotion of democratic values at schools, whereas, the focus of democratic Athenians on military training at academic institutions would have led to their educational vulnerability.

Till the time we do not teach disaster management at schools and make it part and parcel of our culture; unless we do not groom our upcoming generations on tolerance and interfaith harmony, and train them to think beyond the barriers of class-consciousness; till the time we do not familiarize them with the supremacy of rule of law; till the time we do not train them to take on the challenges they will be confronted with, we cannot rid ourselves of our educational vulnerability.

What is Disaster Risk Reduction?

It is a systematic approach of identifying and assessing risk and planning to avoid or minimize it. The aim is to reduce vulnerabilities by building capacities.

Risk Reduction = Hazard * Vulnerability/Capacity

What is Capacity?

Capacity is the sum total of all available resources and skills coupled with organizational decisions, rules and regulations for their efficient administration.

For example, a fire extinguisher is a resource, the knowhow to use it is a skill and the compulsion of installing it is a rule whereas, where to install it, when and how to conduct the firefighting training, etc. are organizational decisions.

Capacity is in fact, a means to reduce risk as it is indirectly proportional to vulnerability. Its types correspond with various types of vulnerabilities including social, attitudinal, environmental, financial, physical and educational.

Disaster Management and Disaster Management Cycle

What is Disaster Management?

It is a scientific approach to prevent a hazard from becoming a disaster. It is a systematic way to prepare for, respond to, recover from and mitigate against a disaster.

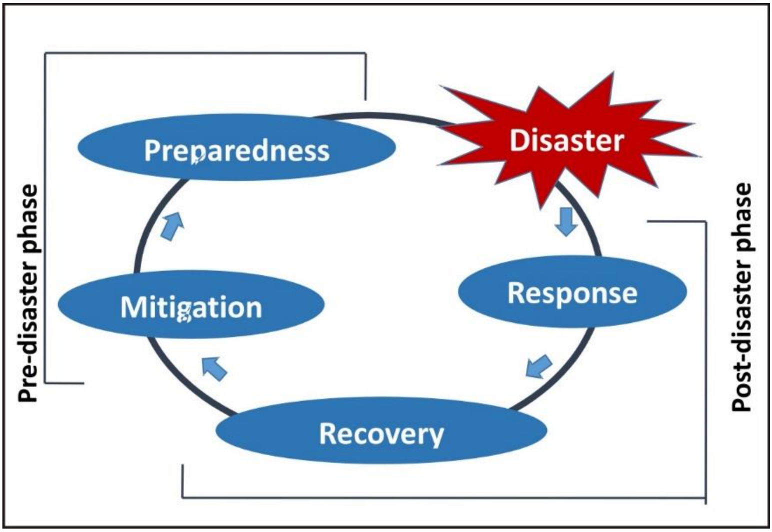
In other words, disaster management is a well deliberated strategy that is implemented before, during and after a disaster. On one hand, it reduces the risk posed by hazards and on the other, it minimizes the loss caused by disasters.

As evident from the figure below, disaster management works in a cycle; it reaches the point from where it started and restarts in a more efficient manner on the basis of lessons learnt from previous experiences.

Disaster management is a process of continuous improvement that keeps on minimizing the gap between disasters and their efficient management.

Disaster management may also be defined as the science of never-ending change towards the better management of the ever-changing nature and impacts of disasters.

Disaster Management Cycle comprises of four steps; preparedness, response, recovery and mitigation. Let’s discuss briefly.



a. Preparedness

It is preparation/homework for the best response to a disaster with planning, training and disaster drills as essential elements. Its functions are to:

i. Identify, assess and monitor the disaster risk, a particular area and its inhabitants are vulnerable to.
ii. Share education and awareness on disaster management with stakeholders by all means of communication.
iii. Formulate a "Preparedness Plan" on what to do before, during and after a disaster with active participation from the concerned community to give it a sense of ownership for ensuring sustainability.
iv. Propagate the "Preparedness Plan" to make the public conversant with "Early Warning" signals and actions required to be taken in the response phase.
v. Train people and rehearse the "Preparedness Plan" on regular basis by undertaking simulation exercises and mock drills.

b. Response

It is putting the well-planned and well-rehearsed "Preparedness Plan" into action. The objectives of this step are to save lives and prevent further damage to human beings, their belongings and environment. The elements of response are as under:

i. Early Warning System: It comprises of the tools and techniques that can predict disasters on scientific grounds and give corresponding output through electrical and optical signals. This also includes accessible, understandable, trusted and relevant communication networks capable of disseminating predictions to vulnerable people.

   For example Fire Alarm Systems are made up of a number of devices that work together to predict a fire by sensing the smoke/ heat and alerting people through sirens.

ii. Evacuation: Moving away from danger at the earliest as per the preplanned and practiced routes indicated usually through exit signs and lights. Evacuation may be small scale as in the case of a building on fire or it may be large scale as in the case of a hurricane.

iii. Search and Rescue: Reaching out to people caught by danger is "Search" and shifting them to a safer situation is "Rescue". Victims requiring search and rescue must be prioritized on the basis of available time and tools, as well as, the safety of the rescuer/s involved. Light trapped victims are rescued first, followed by heavy trapped victims.

   Effective search and rescue comprises of the following seven steps;

   Step 1 – Gather facts. Some of the questions required to be answered are:

   a. Time of day/week –Where the victims are expected to be at that particular time (office, school, home etc.)? How much daylight is available for search and rescue efforts or is artificial lighting available and practical?
   b. Occupancy Type – Where are potential victims likely to be in the collapsed structure and how many they are?

c. Construction Type – What types of construction have been affected? What are the implications for search and rescue?
d. Hazards– What hazards are present (such as downed power lines, natural gas leaks, flooding, animals, hazardous materials, or a structure susceptible to additional collapse during the rescue)?
e. Weather – What is the current and forecast weather? How will the weather affect rescue efforts?

Step 2 – Assess damage to the building. Categories that will serve as reference point are;

a. If structural damage is light (superficial or cosmetic damage, broken windows, fallen plaster; primary damage to contents of structure) then search and rescue mission is to locate, triage, and prioritize removal of victims to designated treatment areas by medical operation teams.
b. If structural damage is moderate (questionable structural stability; fractures, tilting, foundation movement or displacement) the search and rescue mission is to locate, stabilize, and immediately evacuate victims to a safe area while minimizing the number of rescuers inside the building.
c. If the structural damage is heavy (obvious structural instability; partial or total wall collapse, ceiling failures) then the search and rescue mission is to secure the building perimeter and control access into the structure by untrained but well-intentioned volunteers.

Step 3 – Identify your resources such as personnel, equipment, and tools that are available to assist in rescuing victims.

Step 4 – Establish rescue priorities, for example, in a certain building there may be water rising, with victims trapped inside. In that case, the priority becomes getting out those victims who can be easily reached and removed without putting any rescuers at risk.

Step 5 – Develop a rescue plan, for instance, in the example just cited, the plan might be, "Joe, you and Bill do a quick search of the first floor. John and Sue, gather up all the lose 2 x 4 lumber

you can find and break it into lengths of 3 feet and 6 feet. Sally, you will keep in voice contact with Joe and Bill when they go inside, any questions? Great, let's get started."
Step 6 – Conduct the rescue by getting into action.
Step 7 – Evaluate your progress, the rescuers must continually monitor the situation to prevent any harm to the rescuers. Also, they determine if their plan is working, and if not, how it can be changed to make it work".
(www.nbcert.org)
(en.wikipedia.org)

The following procedure has been found to be effective by search and rescue experts.

a. **Call Out.** Begin the search by shouting something like, "If anyone can hear my voice, come here." If any victims respond, give them further directions such as "Stay here" or "Wait outside" (depending on the condition of the building). Be sure to ask victims for any information they may have about building damage or about others trapped in the building.
b. **Be Systematic.** Use a systematic search pattern to ensure that all areas of the building are covered. For example Bottom-Up/Top-Down for multi-story buildings, or Right Wall/Left Wall for single-floor structures to avoid repetition. The wall is the rescuer's lifeline. If you or your partner becomes disoriented, reverse your steps, staying close to the wall until you get back to the doorway. Throughout your search, maintain voice contact with your partner so you do not get separated.
c. **Listen Carefully.** Stop frequently and just listen for tapping sounds, movement, or voices.
d. **Triangulate.** Triangulation enables rescuers to view a single location from several perspectives. Three rescuers, guided by victim sounds, form a triangle around a designated area and direct flashlights into the area. The light shining from different directions will eliminate shadows that could otherwise hide victims.

   e. **Use the Buddy System.** Working together, two rescuers can search a structure more effectively and provide an additional measure of safety to each other. Buddies should also use a web belt to connect one another, especially in dark or smoke-filled areas.
   f. **Mark Searched Areas.** Marking searched areas prevents duplication of efforts and identifies where rescuers are and have been.
   g. **Document Results.** Keep complete records both of removed victims and of victims who remain trapped or dead, then report this information to emergency agencies when required. (www.nbcert.org)

iv. First Aid: It is the early medical assistance extended to a victim before he reaches a doctor. Its objectives are to alleviate suffering, prolong life and prevent added injury or danger (Any First Aid Manual may serve the purpose).

v. Triage: It is the process of determining the order and priority of treatment for various victims on the basis of the gravity of their condition because resources are not enough for all to be treated immediately. This order and priority determined by the search and rescue team, is usually indicated by four types/colors of triage tags/prefabricated labels;

   1. Black – not required to be taken to the hospital. They are dead or likely to die regardless of what medical care they receive. They shall be medicated for alleviation of pain.
   2. Red – immediately required to be taken to the hospital. They have life threatening injuries.
   3. Yellow – required to be taken to the hospital but after the victims with red tags. They have non-life threatening injuries.
   4. Green – not required to be taken to the hospital. They are likely to live regardless of what medical assistance they receive. They have minor injuries.

vi. Damage Assessment: it is the onsite preliminary evaluation of loss caused by a disaster. It highlights what needs to be restored or replaced and also estimates the resources and time required for doing that. Damage assessment, in fact, links "Response" with "Recovery", which is the next step of the disaster management cycle.

c. Recovery

It is a well deliberated effort to get back to normal through a window of opportunity by adhering to the universally acknowledged principle of "converting adversity into opportunity". For instance, construction of a seismic resistant and state of the art hospital in place of an ordinary one destroyed by an earthquake.

Recovery comprises of:

1. Rehabilitation – This is short-term recovery which is immediate and tends to overlap with response. The authorities restore interrupted utility services, clear roads, and either fix or demolish severely damaged buildings. Although called short-term, some of these activities may last for weeks.
2. Reconstruction – This is long-term recovery which may continue for a number of months, sometimes years, depending on the severity and extent of the damage. For example, it may include the complete redevelopment of damaged areas. The goal is to return to a state better than before the disaster.

d. Mitigation

This is the structural or non-structural manifestation of corrective measures to reduce the risk posed by a hazard and the loss caused by a disaster.

"Structural" means any physical construction or engineering technique such as retrofitting and reinforcement. "Non-structural" means any measure not involving physical construction that uses knowledge, practice or agreement, and may be implemented through policies and laws, public awareness raising, training and education (UNISDR).

For instance, the implementation of building codes is structural mitigation and making it mandatory through legislation is non-structural mitigation. Undertaking vulnerability analyses, zoning and land use management, strengthening preventive health care are some more examples of non-structural mitigation.

In case of structural mitigation, retrofitting and reinforcement often prove to be more economical than building a new structure.

- Retrofitting: Providing a new feature to an already existing structure to make it disaster resistant.

  For example, the addition of pillars and beams to a non-resistant building located in an earthquake prone area to make it earthquake resistant; or the introduction of flood walls around an ordinary building in a flood vulnerable zone to make its flood resistant.

- Reinforcement: Strengthening already existing structures or their individual parts by provision of increased load capacities. The need for it usually arises when a building no longer can stand tall to the current challenges as a result of overloading or undesirable defects. Sometimes it is undertaken for preservation of buildings of architectural or historical value.

Effective mitigation guarantees that fewer people and communities will become victims of a disaster.

Principles of Disaster Management

In March of 2007, FEMA's Emergency Management Higher Education Project convened a working group of emergency management practitioners and academicians to consider principles of emergency management.

The group agreed on eight principles that will be used to guide the development of a doctrine of emergency management.

Emergency Management must be

1. **Comprehensive** – Emergency managers consider and take into account all hazards, all phases, all stakeholders and all impacts relevant to disasters.
2. **Progressive** – Emergency managers anticipate future disasters and take preventive and preparatory measures to build disaster-resistant and disaster-resilient communities.
3. **Risk-driven** – Emergency managers use sound risk management principles (hazard identification, risk analysis, and impact analysis) in assigning priorities and resources.
4. **Integrated** – Emergency managers ensure unity of effort among all levels of government and all elements of a community.
5. **Collaborative** – Emergency managers create and sustain broad and sincere relationships among individuals and organizations to encourage trust, advocate a team atmosphere, build consensus, and facilitate communication.
6. **Coordinated** – Emergency managers synchronize the activities of all relevant stakeholders to achieve a common purpose.

   Coordination is the synchronization and integration of activities, responsibilities, and command and control structures to ensure that the resources of an organization are used most efficiently in pursuit of specified objectives. Along with organizing, monitoring and controlling, coordinating is one of the key functions of management.

(www.businessdictionary.com)

7. **Flexible –** Emergency managers use creative and innovative approaches in solving disaster challenges.
8. **Professional** – Emergency managers value a science and knowledge-based approach based on education, training, experience, ethical practice, public stewardship and continuous improvement.

This Implies that Effective Disaster Management

1. **Comprehensive.** Encompassing:
   a. All hazards a particular community, its belongings and environment is vulnerable to.
   b. Each risk that can transform a hazard into a disaster.
   c. All impacts (social, psychological, physical, financial, environmental and educational) of a hazard or a disaster and their scientific analysis for managing them in the best possible manner.
   d. All phases of Disaster Management Cycle ranging from systematic pre to post disaster interventions that can prevent the actualization of risk beyond capacity.
   e. All stakeholders whether vulnerable to a hazard or not who can prevent a hazard from transforming into a disaster, i.e. various local, national and international governmental or non-governmental organizations and people with a focus on the vulnerable communities and the most vulnerable groups among them.
2. **Progressive.** To:
   a. Be proactive rather than reactive, i.e. anticipating disasters rather than waiting for them to strike.

  b. Carry out systematic identification and analysis of the risk posed by various hazards, and provide a scientific basis for formulation of a pragmatic plan to reduce risk.
  c. Pinpoint the appropriate structural and nonstructural measures and capacity building initiatives to be observed in mitigation and preparedness phases.
  d. Correspond to the requirements of time and space.

3. **Risk-Driven.** To:
  a. Assess with accuracy various levels of risk posed by various hazards and draw a logical and well defined comparison between them.
  b. Prioritize the allocation of resources and efforts as per the prioritized risk.

4. **Integrated.** To:
  a. Build partnerships in stakeholders "among disciplines and across all sectors, including private sector and media" before a disaster.
  b. Institutionalize the TORs of various assignments to economize the mainstreaming of disaster risk reduction by all possible means.

5. **Collaborative.** To:
  a. Create and strengthen a culture of team spirit on equal footings through formal and informal consultations based on mutual trust and respect.
  b. Promote a congenial environment for attending each other's concerns on the basis of science and reason.
  c. Develop a sense of preference for collective good over individual interests.

6. **Coordinated.** To:
  a. Synchronize the execution of functions, roles and responsibilities through well-crafted laws, policies and

operating procedures based on local, national and international current best practices.

   b. Ensure the extraction of maximum output from minimum input through well-planned, unity of efforts for the attainment of overall objectives.

7. **Flexible.** To be:
   a. Dynamic for developing creative solutions based on ever-changing consequences of an event.
   b. Applicable to all emergency situations.
   c. Receptive not only to the best course of action but the one that can best be executed under the circumstances.

8. **Professional.** To:
   a. Observe the international code of ethics with a duty to focus on love and care for a victim regardless of his or her caste, creed and race.
   b. Practice the profession as per the standards and guidelines certified by internationally reputed associations and boards.
   c. Have classified knowledge of past and present experiences of disasters and their management, with futuristic interpretations.

International Frameworks

Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters

A Paradigm Shift in Disaster Management

168 countries from around the globe signed an agreement in Hyogo (Japan) to modify their basic approach to disaster management; to be proactive rather than being reactive, to anticipate disasters and prepare to take them on rather than waiting for them to strike; in much the same way that we get vaccinated to prevent the occurrence of an infection or minimize its impacts rather than getting infected and then taking antibiotics.

The secret of successful disaster management was unfolded with a universal undertaking to focus more on pre-disaster than post-disaster management in line with a popular slogan that reads “prevention is better than cure”. The management and reduction of risk was declared the prime obligation to be attained through five priority areas.

Priority Action 1: Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.

Countries that develop policy, legislative and institutional frameworks for disaster risk reduction and that are able to develop and track progress through specific and measurable indicators have greater capacity to manage risks and to achieve widespread consensus for, engagement in and compliance with disaster risk reduction measures across all sectors of society.

Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning.

The starting point for reducing disaster risk and for promoting a culture of disaster resilience lies in the knowledge of hazards and all physical, social, economic and environmental vulnerabilities to disasters that most societies face; and, of the ways in which hazards and vulnerabilities are changing in the short and long term; followed by, action taken on the basis of that knowledge.

Priority Action 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels.

Disasters can be substantially reduced if people are well informed and motivated towards a culture of disaster prevention and resilience, which in turn requires the collection, compilation and dissemination of relevant knowledge and information on hazards, vulnerabilities and capacities.

Priority Action 4: Reduce the underlying risk factors.

Disaster risks related to changing social, economic, and environmental conditions, and land use, and the impact of hazards associated with geological events, weather, water, climate variability and climate change, are addressed in sector development planning and programmes as well as in post-disaster situations.

Priority Action 5: Strengthen disaster preparedness for effective response at all levels.

At times of disaster, impacts and losses can be substantially reduced if authorities, individuals and communities in hazard-prone areas are well prepared and ready to act, and are equipped with the knowledge and capacities for effective disaster management."

What needs to be done in follow-up of HFA

Priority Action 1:

a. Create a policy, legal and institutional framework with an active constitutional and financial backing.
b. Institutionalize disaster management through a specialized organization comprising of a hybrid team of dynamic, creative and well paid professionals from all relevant fields.
c. The organization, with its tentacles even in the lowest administrative unit of the country, must have the status of a

special institution and it must work as part and parcel of the office of, nobody less than the chief executive of the state.

d. The basic task of the disaster management organization must be the formulation and execution of SDMP (State Disaster Management Plan) with characteristics as identified in "Priority Action 2".

Priority Action 2:

a. Carry out the risk/ vulnerability analysis of various parts of the country. The analysis must be comprehensive, i.e. inclusive of all hazards, all phases, all possible impacts and all stakeholders.
b. Identify measures to be adopted for reduction of risk through mitigation and preparedness.
c. Mainstream DRR (Disaster Risk Reduction) into development by undertaking risk-driven mitigation measures in all projects.
d. Specify clearly the roles and responsibilities of various stakeholders including government departments with respect to DRR measures planned to be taken.
e. Follow the principles of disaster management to ensure a continuous process of planning and implementing Community Based Disaster Risk Management (CBDRM) policies and procedures.

Priority Action 3:

a. Incorporate disaster management in the curriculum of academic institutions right from the primary level to make it an integral part of the prevailing culture.
b. Declare disaster preparedness as one of the criteria for gauging an academic institution's performance.
c. Organize disaster preparedness competitions at schools and colleges and decorate the winners with distinctions and awards.

Priority Action 4:

a. Take a meticulous account of all types of vulnerabilities/ fundamental factors (i.e. social, environmental, physical, attitudinal, financial and educational) that make you susceptible to the adverse impacts of various hazards.

b. Make an all-inclusive plan to remove or reduce each type of vulnerability.

c. Practice and preach the plan with patronage from all tiers of the government.

Priority Action 5:

a. Launch a well-informed and well-planned countrywide campaign on disaster awareness through mass media.

b. Build capacity at all levels by providing resources, imparting skills and conducting disaster drills on a regular basis.

c. Ensure participation from the highest ranks of the government including the Chief Executive of the State himself, in respective capacity building sessions.

Sendai Framework for Disaster Risk Reduction (2015-30)

In continuation of the Hyogo Framework for Action, the Sendai Framework supports the paradigm shift from a reactive to a proactive approach towards disaster management. The need for preparedness and mitigation measures such as getting vaccinated to prevent the occurrence of a disease or minimize its impacts, is being felt even more. The belief, that risk is compulsory; loss is optional, has been reinforced. Also, mainstreaming of Disaster Risk Reduction in all undertakings particularly development, whether international, national or local, has been further underlined.

The Sendai Framework upholds that the state has to perform the primary duty of reducing disaster risk but it has to be performed in a participatory manner, i.e. Community Based Disaster Risk Management (CBDRM).

Between the lines of Sendai Framework for Disaster Risk Reduction it has been voluntarily pledged that no stone shall be left unturned in systematic efforts to:

- Incorporate the science of disaster management in all current cultures of the world with more emphasis on Disaster Risk Reduction (DRR) through mitigation and preparedness.
- Minimize vulnerabilities by maximizing capacities; invest more in DRR for resilience.
- Practice the science of disaster management in a participatory manner.
- Institutionalize disaster management priorities from international to local level through Community Based Disaster Risk Management (CBDRM).
- Follow agreed upon principles of effective disaster management and build partnerships; make CBDRM sustainable by making it comprehensive, progressive, risk-driven, integrated, collaborative, coordinated, flexible and professional between stakeholders including private sector and media.

Sendai Framework for Disaster Risk Reduction is a 15-year, "voluntary, non-binding" agreement adopted by UN Member States on 18 March 2015 at the 3rd UN World Conference on Disaster Risk Reduction (WCDRR).

UNISDR has been tasked to support the implementation, follow-up and review of this global contract which aims for the following outcome:

> *"The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries."*

It is termed as the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action.

Seven Global Targets

1. Substantially reduce global disaster mortality by 2030, aiming to lower (average per 100,000) global mortality rate in the decade 2020-2030 compared to the period 2005-2015.

2. Substantially reduce the number of affected people globally by 2030, aiming to lower (average global figure per 100,000) in the decade 2020 -2030 compared to the period 2005-2015.
3. Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.
4. Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, while developing their resilience by 2030.
5. Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.
6. Substantially enhance international cooperation for developing countries through adequate and sustainable support to complement their national actions for implementation of this Framework by 2030.
7. Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to people by 2030.

Four Priorities for Action

Priority 1: Understanding disaster risk

Disaster risk management should be based on an understanding of disaster risk in all its dimensions of vulnerability, capacity, exposure of persons and assets, hazard characteristics and the environment. Such knowledge can be used for risk assessment, prevention, mitigation, preparedness and response.

Priority 2: Strengthening disaster risk governance to manage disaster risk

Disaster risk governance at the national, regional and global levels is very important for prevention, mitigation, preparedness, response and recovery. It fosters collaboration and partnership.

Priority 3: Investing in disaster risk reduction for resilience

Public and private investment in disaster risk prevention and reduction through structural and non-structural measures are essential to enhance the economic, social, health and cultural resilience of persons, communities, countries and their assets, as well as the environment.

Priority 4: Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction

Increased disaster risk means there is a need to strengthen disaster preparedness for response, take action in anticipation of events, and ensure capacities are in place for effective response and recovery at all levels. The recovery, rehabilitation and reconstruction phase is a critical opportunity to build back better, while integrating disaster risk reduction into development measures.

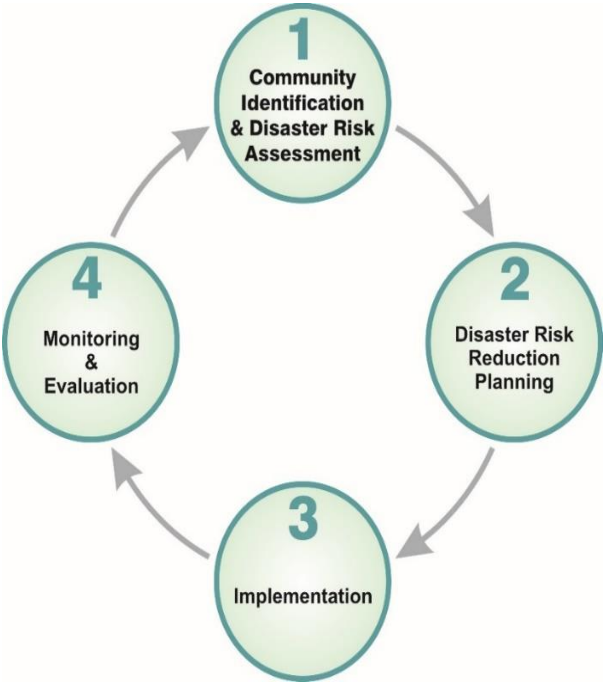
What needs to be done in follow-up of SFA

Actions required to be taken in pursuance of HFA (as identified on previous pages) against each of its priority areas, must be pursued with more resourcefulness and an increased sense of urgency.

Disaster Risk Management (DRM) and Community Based Disaster Risk Management (CBDRM) – Cycles

DRM Cycle

Since the focus has shifted from a reactive to a proactive attitude towards disasters, the DRM cycle has gained more relevance.


1
Community Identification & Disaster Risk Assessment
2
Disaster Risk Reduction Planning
3
Implementation
4
Monitoring & Evaluation

The DRM Cycle comprises of four steps and works as under:

1. **Community identification and disaster risk assessment**

   Communities at risk are identified. Hazards and vulnerabilities are analyzed to assess the risk a particular community is exposed to.

2. DRR Planning

Structural and nonstructural measures and capacity building initiatives required to be taken are identified and streamlined through a formal plan.

3. Implementation

Capacity building training sessions on "how to carry out implementation" are conducted; implementation procedures/regulations are managed, and resources are mobilized and allocated.

4. Monitoring and Evaluation

The M & E plan is designed and executed. Data and information is collected, analyzed, documented and shared for rectification and improvement.

The DRM Cycle transforms into the CBDRM Cycle when applied in a participatory manner by building partnerships between all stakeholders including the community.

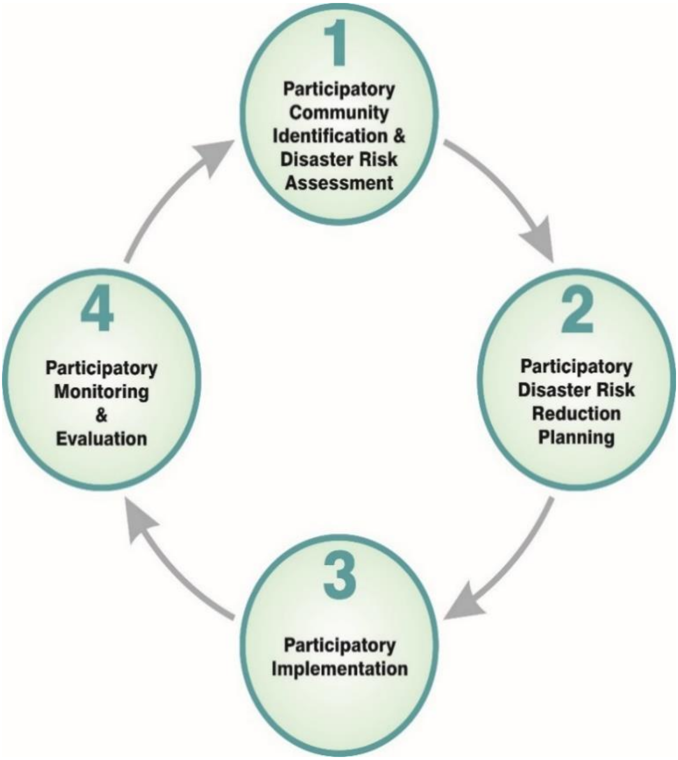
The CBDRM Cycle

Philosophy

Effective and sustainable disaster management is not possible without community participation because the community, being the first victim is the first responder as well.

Definition

When all stakeholders, including communities collectively anticipate disasters through scientific analysis of the risks posed by various hazards; undertake appropriate DRR planning; and, carry out its best possible implementation followed by monitoring and evaluation exercises, all through a participatory approach; and, in doing so take a fresh start to re-anticipate the same disasters in a more efficient manner and manage them more effectively.


1
Participatory Community Identification & Disaster Risk Assessment
2
Participatory Disaster Risk Reduction Planning
3
Participatory Implementation
4
Participatory Monitoring & Evaluation

Methodology

1. Sensitization

a) Establish contact with community through meetings, workshops, seminars, etc.

b) Make them conscious of the risk they are exposed to by discussing their vulnerability to various hazards.

c) Make them believe that they can reduce risk by shifting from a reactive to a proactive approach towards disasters. Quote simple examples to prove the point both from the developing and the developed world.

2. Confidence Building

a) Encourage them to participate in discussions.

b) Give them a sense of ownership by involving them in decision making.

3. Partnership Building

a) Make disaster management committees with fair representation from the community.

b) Promote team spirit and create an environment of trust and respect for each other's views with a preference for the collective good.

4. Capacity Building

a) Provide resources through stockpiles of emergency response tools.

b) Impart skills through trainings, exercises and drills.

c) Develop an enabling environment through formulation of rules, policies and procedures.

5. Institutionalization

a) Determine the functions, roles and responsibilities with input from representatives of the community in light of national and international priorities.

b) Organize TORs of various assignments to economize efforts.

c) Enforce rules, policies and procedures.

6. Execution

Implement the CBDRM Cycle.

Case Studies

Case Study: CBDRM

Organization

The Earthquake Reconstruction and Rehabilitation Authority (ERRA) Pakistan which was established on October 24, 2005 in the aftermath of the October 8, 2005 earthquake, the deadliest in the history of the country. Damage assessments revealed the following:

- 73,000 people killed including 18,000 students
- 128,000 severely injured and 41,000 disabled
- 600,000 houses destroyed rendering 3.5 million people shelterless
- 5,782 educational facilities, 701 governance buildings, 574 health facilities, 4,830 water and sanitation schemes, 92 bridges, 2,393 kilometers of road damaged, etc.

ERRA's vision was to "convert adversity into opportunity" and its mission to "rehabilitate and reconstruct, lost and destroyed facilities following the highest standards of rehabilitation and reconstruction with an obligation to "Build Back Better".

The cost of the reconstruction portfolio was US$ 5.2 billion to be provided by the international community including United Nations. The portfolio included 14,000 projects of which, so far about 10,000 stand completed in eleven sectors, under three cross cutting themes.

Sectors:

1. Housing
2. Education
3. Health
4. Water & Sanitation
5. Governance
6. Power

7. Telecommunication
8. Transportation
9. Livelihood
10. Social Protection
11. Environment (facilities)

Cross-cutting themes:

1. Gender Equality
2. Environment (safeguards)
3. Disaster Risk Reduction

Project

A Disaster Risk Management Program (DRMP) launched in the nine earthquake affected districts of the State of Azad Jammu & Kashmir and Khyber Pakhtunkhwa province, for the implementation of HFA at a grassroots level.

Recognition

In its 2010 compilation of global good practices and lessons learnt by local governments in disaster risk reduction, UN/ISDR selected ERRA's DRM Program as one of 14 model case studies. The UNISDR publication is available on their website: www.unisdr.org.

Funding

The project was funded by World Bank with technical support from UNDP. The total cost of the project was estimated at US $ 5.976 million.

Vision

To make the October 2005 earthquake affected communities relatively safer from future hazards by increasing their awareness about disasters and developing local response and institutional capacities.

Goals

- Reduction of existing disaster risks by increasing awareness and resilience of local authorities and communities, against the negative impact of natural hazards.

- Prevention of the build-up of new risks by taking into account disaster risks in the planning processes of local authorities and communities.
- Adaptation to changing risk factors.

Objectives

1. To provide awareness and capacity building on disaster risk management at community level to render local communities disaster resilient.
2. To mainstream disaster risk reduction in district planning processes in order to prevent the further build-up of risks through risk-conscious investments and activities and to better respond to disasters through effective preparedness.
3. To provide hazard and risk maps and other related information to relevant authorities.

Major Components

a. Orientation & Coordination Meetings

To familiarize key stakeholders with the concept and importance of Disaster Risk Management, orientation meetings and workshops were organized in all districts to solicit the participation of district administration personnel, notables of the area and representatives of INGOs, NGOs, CBOs, etc.

b. Social Mobilization

Risk consciousness was considered the first step towards social mobilization. Communities were sensitized on the hazards they were exposed to and their vulnerability to them.

c. Formulation of Union Council Disaster Management Committees (UCDMCs) and Union Council Emergency Response Teams (UCERTs)

In light of consultations made with local authorities and elders UCDMCs comprised of 15 participants (7 government employees of different departments such as health, education, revenue, law enforcing agencies, agriculture, forest, local elected representatives, CBOs, etc. and 8 community notables and volunteers with adequate gender representation). No age limit for a volunteer was specified provided he or she was healthy, active and motivated.

UCERTs comprised of 50 members on the basis of the following agreed upon criteria:

i. Possession of CNIC
ii. Education - At least matriculate
iii. Age - Below forty years
iv. One person out of a family
v. Motivated, healthy and energetic volunteers
vi. Representation from all revenue villages

d. Development of Training Curriculum

i. The UCDMC course included:

- DRM Project Overview
- National Disaster Risk Management Framework
- DRR - Basic Concepts and Definitions
- Disaster Risk Management Cycle
- Introduction to Local Hazards and Safety Tips
- Hazard, Vulnerability and Capacity Assessment
- Crises Management Planning
- Mainstreaming DRR at Community Level
- Emergency First Aid
- UCDMC and UCERT - Structures and Responsibilities

ii. The UCERT course included:

- DRM Project Overview
- National Disaster Risk Management Framework
- DRR - Basic Concepts and Definitions
- Disaster Risk Management Cycle
- Introduction to Local Hazards and Safety Tips

- Emergency First Aid (theory & practical)
- Search & Rescue (theory & practical)
- Fire Fighting (theory & practical)
- Information, Communication, Administration and Logistics
- Simulation Exercises

e. Organization of Trainings

- Two Master Trainers were sent to each union council to conduct separately organized trainings for UCDMCs and UCERTs.
- The duration of the training was four days for UCDMCs and six days for UCERTs.
- Trainings were imparted as per predefined training modules.
- Female participation was strongly encouraged with separate training sessions for them in culturally sensitive areas, where they could not participate with male members.
- A complete record of the training was maintained and handed over to all concerned.
- Comprehensive post training reports were prepared including group photos, activity pictures with descriptions, Hazard Vulnerability Capacity Assessments, social maps, UC profile, UC crisis management plan, relevant case studies/stories and participants' personal information.
- A total of 19,226 volunteers (including females) were trained and registered.

f. Building Stockpiles of Emergency Response Tools

- Stockpiles of response tools and equipment were purchased through a six member committee headed by Director General Procurement ERRA to ensure quality and transparency.

- Stockpiles of emergency response tool kits were delivered to 303 Union Councils of the nine earthquake affected districts.

g. Handing and Taking Over of Stockpiles

In consultation with Deputy Commissioners/ District Coordination Officers, union council level committees (consisting of the UC Secretary, Patwari and Chairman UCDMC) were constituted to take over stockpiles for their UCs. This committee was responsible for checking the quality/quantity of stockpile items and ensuring their proper storage, safety, security and maintenance. To establish ownership, stockpiles were handed over in the presence of community volunteers. Receipts, duly signed, were obtained from recipients.

District/regional level stockpiles were handed over to the District Disaster Management Authority headed by Deputy Commissioners and District Coordination Officers.

h. Signing MoUs for Safety, Security & Maintenance

Memoranda of Understanding were signed with the state and provincial governments for the safe custody and maintenance of stockpiles.

A guide book for stockpile usage, maintenance, storage, cataloguing, safety and security was also published and distributed to district governments and UCs.

Training sessions for users of technical equipment were organized at ERRA HQ for which the services of international experts were utilized.

i. Social Mapping

Community volunteers prepared UC-specific social hazard maps to assess risks by identifying prevailing hazards and existing vulnerabilities.

j. Event Registers

Over 150 events were recorded from the past 20 years by analyzing available historical profiles of hazards and associated losses.

k. DRR Planning

On the basis of social hazard maps volunteers developed disaster preparedness plans and identified mitigation measures.

l. Simulation Exercises

Demonstration of the roles and responsibilities in information and communication, administration and logistics, search and rescue, first aid, firefighting, etc. was rehearsed on a regular basis through simulation exercises.

Case Study: Owner Driven Recovery & Mitigation

Organization

Earthquake Reconstruction and Rehabilitation Authority (ERRA) Pakistan

Project

A Rural Housing Program executed for the earthquake affected population of the State of Azad Jammu & Kashmir and Khyber Pakhtunkhwa province of Pakistan.

Recognition

Having registered a completion rate of over 96%, the best ever compared to contemporary post disaster programs, this globally accredited Rural Housing intervention won the United Nation's 2011-Sasakawa Award for outstanding performance in Disaster Risk Reduction.

Funding

The project was funded by ERRA and Pakistan Poverty Alleviation Fund (PPAF). The total cost of the project was PKR 71.55 billion.

Vision

To bring the October 2005 earthquake affected communities back to normal through a window of opportunity by constructing seismic resistant houses in a participatory manner.

Goals

- Mainstreaming Disaster Risk Reduction through mitigation.
- Promoting a culture of "Seismic Resistant" construction through "Owner-driven" reconstruction.

Introduction

After initial rescue and relief efforts, the Earthquake Reconstruction and Rehabilitation Authority conceived and implemented its flagship Rural Housing Reconstruction Programme in the years after the October 2005 earthquake.

Private housing was the hardest hit sector, with over 611,059 houses damaged. Non-seismic, conventional building designs; use of poor and inadequate material, as well as construction of houses on hazardous land, were major factors contributing to this devastation.

Indeed, "recovery", through long term reconstruction and rehabilitation of homes, was the main purpose of ERRA's Rural Housing Reconstruction Programme. However, the programme also incorporated "mitigation" and "preparedness" measures to build and strengthen the affected populations' capacity to effectively take on future disasters. This programme is a good example of how different phases of the disaster management cycle are seamlessly, and sometimes simultaneously, pursued.

Recognizing the importance of community participation in disaster risk management, ERRA laid down guiding principles for its Rural Housing Programme, of which the most integral was an owner-driven approach; an assisted and inspected reconstruction regime coupled with a strict compliance mechanism to ensure environment friendly, culturally compatible, seismic resistant structural design standards. Besides technical assistance, the programme envisaged tranche wise disbursement of financial assistance to each affectee.

Key features of the programme are outlined below:

- Damage Assessment
- Design Menu to Meet Local Needs
- Social Mobilization
- Technical Assistance - Inspection and Mobile Training Teams
- Public Information Campaign
- Ensuring Tail End Supply Chain Management
- Support to Vulnerable Families
- Data Management, Reporting and Monitoring and Evaluation System
- A Responsive Grievance Redressal Mechanism

In addition to transforming the landscape of the earthquake affected areas of AJ&K and KP, the programme has brought about profound behavioral changes. Today people in the affected areas are more informed, wiser and conscious about seismic threats and the need for safer buildings. Ordinary labor is now conversant with seismic resistant construction.

After running full swing for four years, this programme was concluded in 2011. ERRA and the Pakistan Poverty Alleviation Fund

(PPAF) has transferred about PKR 72 billion directly to affectees' bank accounts for construction of their houses, which is a landmark achievement. Almost 600,000 seismically safe houses have been reconstructed. As a consequence 3.5 million people have resumed their lives in disaster resilient homes.

Iconic Features of ERRA's Rural Housing Reconstruction Program

a. Owner-Driven Housing Reconstruction

ERRA's Rural Housing Programme was founded on the cardinal principle that beneficiaries would not remain passive recipients of aid and instead would actively participate in the overall reconstruction process. Locals were made in charge of rebuilding their own homes. Quality construction was ensured through monitoring and evaluation. To expedite owner-driven reconstruction, ERRA not only offered technical and financial assistance, but also promoted the use of familiar methods, own labor, and salvaged and easily accessible materials. In hindsight, an owner driven policy ensured speedy completion of the programme and its long term sustainability.

b. Social Mobilization and Capacity Building

Social mobilization and multi-tiered trainings were instrumental for the achievement of ERRA's Housing Sector objectives. As part of its public information campaign, ERRA dedicated time, effort and resources to the production and circulation of a wide range of information products.

In order to implement a seismic resistant reconstruction regime, technical trainings were organized at different administrative levels, from villages to the provincial/state level, to create a multiplier effect. A common curriculum was prepared to ensure uniform building practices across affected districts. As a result of cascade trainings, over 5,500 VRCs (Village Reconstruction Committees) were formed and 720,000 individuals were mobilized and trained including 200,000 women through 27 partner organizations in 232 union councils. Over 200,000 technical persons were also trained to steer seismic resistant reconstruction efforts creating a workforce of semi-skilled and skilled masons, electricians, plumbers, steel fixers, carpenters, artisans and other craftsmen. They were introduced to seismically safe and environment friendly construction techniques to build earthquake resistant homes using available material and indigenous designs, in conformity with the local culture.

c. Damage Assessment

The damage assessment exercise was successfully undertaken by broad based Assistance and Inspection Teams headed by military engineering personnel. As the programme was owner driven, locals also participated in the damage assessment exercise. Damage Assessment Forms and Memoranda of Understanding (MOUs) signed with the affectees were transferred to the National Database and Registration Authority (NADRA), through ERRA, to generate lists for the tranche wise disbursement of housing subsidies. A consistent damage assessment criteria was implemented by Assistance and Inspection (AI) teams across all affected districts.

d. Judicious and Transparent Disbursement of a Uniform Assistance Package / Housing Grant

To help cover the expenses of building a core housing unit, the programme envisaged tranche wise disbursement of a housing subsidy directly into affectees' bank/post office accounts according to the category of destruction. Uniform rates were applied for different categories. For reconstruction of "completely damaged" houses, Rs.175, 000 was released in four tranches and for structural reinforcements in partially damaged houses Rs.75,000 was released in two tranches. Homeowners of negligibly damaged houses were granted Rs.25,000 as temporary shelter support.

Transparency was ensured as over 2 million financial transactions worth US$ 1.3 billion were conducted. The process of payment consisted of four tranche disbursements, preceded by three-tier inspections carried out by AITs to ensure that houses were built in line with the established seismic resistant standards. To ensure judicious use of grants, MoUs with beneficiaries contained penalizing clauses for intentional non-compliance.

Houses were rebuilt on the same places as far as possible, except where vulnerabilities were high in which case houses were relocated. Full spatial coverage was ensured, across all nine affected districts. Also, to avoid double counting, the use of NICs was made mandatory.

e. Assisted and Inspected Reconstruction Regime

Homeowners were provided continuous support through more than 600 Assistance and Inspection (AI) teams mobilized for house-to-house outreach. To ensure compliance, tranche disbursements were linked to various stages of construction and conformity with seismic standards based on technical criteria verified by the Army, UN-HABITAT and ERRA's M&E technical teams. Together these teams have conducted 1.5 million inspection visits. These teams offered targeted and bespoke solutions to affectees to ensure maximum compliance.

f. Construction Material Hubs

In order to provide construction material to the affectees, ERRA established a building materials supply chain comprising 65 private sector construction material hubs at strategic locations in the EQAAs of AJ&K and KP. Hubs were designed to assist in:

- Suppressing price volatilities and market distortions
- Reducing costs associated with logistics
- Improving inventory turnover rates

At a later stage, satellite hubs were also established for people in remote areas. This initiative coupled with human resource training helped expedite reconstruction.

g. Seismic Resistant Conventional Designs

Seismic resistant structural designs and construction guidelines for low cost housing were issued in consultation with key stakeholders. ERRA established a network of Housing Reconstruction Centers (HRCs) to demonstrate and promote ERRA's approved designs. Additionally, seismic zoning and multi-hazard risk mapping were undertaken to guide planning and construction.

To encourage beneficiaries to voluntarily adopt approved designs, ERRA promoted the application of seismic resistant and environment friendly construction techniques that were harmonious with local conventions and culture. Three designs namely RCC, Block and Dhajji were approved in the first phase. Bhattar design was approved later for district Battagram. People were free to choose any of the designs according to their needs, personal preferences and affordability. As a result, the ratio of RCC construction in the EQAAs has increased phenomenally.

h. Environment-friendly Construction Practices

The programme encouraged maximum retrieval and reuse of local timber and other salvaged material to protect fast depleting forests and minimize the adverse impact of reconstruction activities on the environment. An owner-driven approach was preferred over other available options like awarding contracts to professional builders; as the environmental cost of the latter would have been huge. This fact was acknowledged by ADB's Third Party Validation Team in its 2010 Rural Housing Environmental Impact Assessment Report.

i. Grievance Redressal System

To avoid the risk of overlooking a beneficiary, ERRA implemented a participatory and inclusive grievance redressal mechanism through a multi-tiered system from the village level to the Headquarters level. Through the involvement of local communities thousands of cases were resolved in favor of affectees. Three surveys were conducted in 2006 to identify common grievances and beneficiaries' expectations.

At the outset, ERRA realized the need to address the maximum number of financial, technical and administrative grievances at the local level. For this purpose, twelve Data Resource Centers were established throughout the earthquake affected areas and an MIS based grievance redressal mechanism was developed. This system was used to provide updated information to people regarding the status of their applications/complaints. It could track the disbursement of grants through bank account details; and, it served survey/certification teams in the field by providing them with accurate information regarding the classification of houses according to the extent of damage, guiding them whether or not to certify a particular house.

j. Establishment of a Dedicated Housing Complaints Cell at ERRA HQ

A dedicated Housing Complaints Cell was established at ERRA's Headquarters which resolved over forty thousand cases. To augment the Grievance Redressal Mechanism, an automated management information system called the 'Housing Complaints Manager' was developed to track all grievance applications till the time they were disposed off. The Complaints Cell attended to individual complaints; compiling, segregating and sharing them with the programme management, which helped identify common issues and their solutions. Cases submitted by vulnerable complainants were resolved on a priority basis.

k. Special Focus on Vulnerable Groups

ERRA's inclusive approach meant that vulnerable families were given preferential treatment. Over 55,000 women headed households were granted Rs.9 billion, on priority basis, to help rebuild their homes. Over 200,000 women participated in training, awareness and community mobilization activities.

l. Improved Living Standards

ERRA’s Rural Housing Reconstruction Programme promoted higher standards of living. Separate bathrooms, kitchens and bedrooms became essential features of newly constructed houses, resulting in better living conditions.

DRM Best Practices and SOP Document

Preamble

Since the 2005 earthquake and the 2010-11 floods, disaster risk management (DRM) has received increased attention in Pakistan. The development sector has shown a growing interest in community-based disaster risk management (CBDRM) as an effective way to build people's resilience against disasters. There have been a number of CBDRM initiatives in the country since 2005, however, very few have been meaningfully assessed. The lack of documentation, the implementation of CBDRM initiatives in isolation, and limited evaluations make it difficult to identify and highlight good practices.

It is in this context that Action against Hunger ACF-International (Pakistan Mission) ventured to document CBDRM Best Practices in Pakistan based on secondary as well as primary research conducted by the author himself.

ACF Supports CBDRM Documentation

The ensuing description of Community Based Disaster Risk Management is based on desk and field research conducted with the support of ACF International, working to build disaster resilience in Khyber Pakhtunkhwa.

To improve its operational efficiency ACF International, Islamabad, organized a workshop in Peshawar, KP, on Disaster Risk Management Best Practices, which was funded by the Norwegian Embassy. The ultimate goal of this intellectual endeavor was the development of a consensual DRM Best Practices and SOP Document based on secondary and primary data collection through a form/questionnaire that was initially circulated amongst key stakeholders (local and national NGOs) and, later, filled collectively by participants of the workshop who were, in fact, representatives of the same NGOs. Prior to group work participants were given a fair comprehension of DRM basic terminologies and concepts, DRM

Cycle, HFA, NDRMF, NDRMP, Disaster Management Structure and Current DRM Best Practices in Pakistan. The outcome was a DRM Best Practices and SOP Document designed to help ACF improve the outcomes of its current DRM Program. Its objective was to improve the quality and overall effectiveness of DRM practices and build resilience at a grass roots level through "Community Based Disaster Risk Management".

The following description of the Community Based Disaster Risk Management Process borrows elements from the research conducted for ACF-International.

CBDRM

CBDRM is an extension of DRM in that disaster prevention, mitigation, preparedness, response and recovery measures are developed by members of a vulnerable community, based on their needs, capacities and perceptions of risk. In CBDRM, communities "at risk" are actively engaged in the identification, analysis, treatment, monitoring, and evaluation of disaster risks, in order to reduce their vulnerabilities and enhance their capacities. This means that people are at the heart of planning and implementing DRM activities.

CBDRM Cycle

The Community Based Disaster Risk Management Cycle underscores the need for an inclusive, holistic and owner-driven approach. For example, an Awareness Raising campaign may be a popular DRM activity but its success is heavily dependent on whether the information being imparted is relevant; well received by the target audience resulting in wide participation; and, among other things, are the methods used in line with local customs and cultural norms? These variables must be accounted for and, the only way to do so is by following the CBDRM cycle when designing a DRM activity. The relevance of an activity can be ensured through community profiling and participatory risk assessment. Involving the target community in planning and implementing an activity will ensure that the initiative is in line with local norms and customs thus drawing wide participation. The following sections describe briefly each phase of the CBDRM cycle.

Community Profile and Participatory Risk Assessment

Purpose

- To identify and profile the community – defining characteristics.
- The community will participate in the identification, analysis and ranking of disaster risks, hazards, vulnerability and their capacity.

Steps

1. Identify and profile the target community.
   a. Vulnerable communities could request assistance OR
   b. Disaster management organizations could identify them using a criterion such as: most disaster prone area; most vulnerable to a particular hazard; poor areas; least served by the government and/or NGOs; possibility of effects of the program spreading to neighboring communities, etc.
2. Establish contact and relationship with stakeholders such as;
   a. Representatives from government authorities/ line departments,
   b. Facilitators (villages, union councils),
   c. Local people (community-based groups),
   d. Vulnerable groups.
3. Establish an Assessment Team with representation from the community.
4. Train the Assessment Team to work with the community and undertake HVCA.

5. Conduct participatory Assessment of Hazards, Vulnerability, Capacity and people's perceptions of Risks. Information may be collected though community meetings, interviews and focus group discussions. Assessment tools are shown in the table that follows.

6. Organize and document assessment results and share with communities

   After the HVCA (Hazard, Capacity, Vulnerability Assessment), the team organizes a meeting with all villagers to keep them informed and to solicit feedback. In this meeting, identified risks will be ranked by communities themselves. Results from risk assessment will be inputs for DRM planning (the third phase) and will also provide indicators for M&E (the fourth phase) to evaluate changes in vulnerability and capacity of the community. These should be shared with communities, local government agencies and other stakeholders.

Tools

	Risk Assessment Tool	**Purpose/Expected Results**
1	HVCA	Develop a complete picture about the hazards, vulnerabilities and capacities of the community in order to find a suitable coping strategy.
2	Historical profile	Collect relevant information about past events in order to help local people be more aware of the changes that occurred in their community
3	The hazard map	Develop a comprehensive overview of the main features of an area and identify hazards, risk factors, safe areas, available resources.

4	Hazard and seasonal calendar	Identify periods of stress, hazards, diseases and vulnerability; identify what people do in these periods; when do they have time for community activities, what are their coping strategies; and, identify gender specific division of work in times of disasters and otherwise.
5	Transect walk	Develop a picture of danger zones, sites of evacuation, land use zones, and seek problems and opportunities in disaster management by interacting with target communities.
6	Livelihoods analysis and Household Wealth Ranking	Understand livelihood strategies, behavior, decisions and perceptions of risk, capacities and vulnerabilities of households from different socio-economic backgrounds.
7	Health and nutrition assessment	Assess the general health of the population to underscore vulnerabilities in this regard and also help gauge robustness and resilience, i.e. capacity.
8	Gender resource mapping	Identify the roles that women can play in DRM and their scope.

The above mentioned tools can be developed through;

1. Secondary data collection,

2. Direct observation,
3. Structured and semi-structured interviews,
4. Group discussions.

Participatory Risk Reduction Planning

Purpose

- To develop a disaster risk reduction plan through a participatory process with the target community
- Integrate disaster risk reduction into local development planning

Steps

1. **Set Vision and Mission**

   Encourage community members to envision and express their dream for a “safe community”. Community members, authorities and other stakeholders must reach a consensus about what they want to achieve through disaster risk management.

2. **Identify Disaster Risk Reduction Measures**

   Community members can now identify and prioritize measures to reduce vulnerability and increase capacity that will help attain their vision of a safe community. Activities can be categorized as those to be implemented before, during and after a disaster. There can be structural and nonstructural measures. Initiatives may be grouped into the following (and more) areas of concern: early warning, capacity building, child protection, livelihood, water and sanitation, environment, and evacuation/ temporary shelters.

3. **Develop the Main Plan**

   Contents of the main plan:

   a. Background information (socioeconomic, livelihood, infrastructure, WASH and health conditions)

b. Situational analysis and summary of assessment results of hazards, risks, vulnerability and capacity

c. Objectives

d. Beneficiaries (direct as well as indirect)

e. CBDRM action plan (time frame, resources needed within and outside communities, preparedness and response measures, roles and responsibilities)

4. Integrate and Mainstream CBDRM into UC and District Plans

The CBDRM planning process should take place through a participatory process at the village level. After village plans are developed they should be compiled and used as the basis of Union Council (next administrative unit) CBDRM plans. The UC planning process should involve a series of meetings with village representatives to formalize overall objectives which will provide input for district CBDRM plans. For the implementation of the plan, resources (human, time, financial, etc.) within and outside the target communities should be identified. Targets can be collectively identified based on village priority lists.

Risk Reduction Measures

From risk assessment results, communities can identify appropriate disaster risk reduction measures. These measures include:

1. What to do before, during and after disasters
2. Structural and non-structural measures

The table identifies some risk reduction measures to be taken before, during and after a disaster. This list is not exhaustive.

Before a disaster	a. Policy and strategy: Develop annual action plan for disaster prevention and mitigation in line with local DRR needs. b. Infrastructure: Ensure implementation of building codes including retrofitting and reinforcement. c. Communication system: Develop an early warning system and communication network for search & rescue, and other phases. d. Support livelihood activities: Develop a crops and harvest calendar to avoid disasters; change to safer production choices. e. Training and awareness: Create search & rescue, and other teams; conduct simulations; impart knowledge about disasters and build capacities in disaster preparedness for communities. f. Other disaster preparedness activities: Store supplies such as seeds/harvest above flood levels; stock food, water and medical supplies; earmark buildings that can serve as shelters during disasters.
During a disaster	a. Emergency response: Activate emergency response plan; mobilize search and rescue teams. b. Evacuation: Evacuate people to safe places; assist the elderly, children and disabled to reach safety. c. Health care: Ensure availability of hospitals, doctors, medicines and proper food. d. WASH: Ensure access to safe water, adequate sanitation and proper hygiene.
After a disaster	a. Rehabilitation of basic services for communities: Temporary houses, health care, water and sanitation, transportation, etc. b. Reconstruction: Replace lost buildings and improve infrastructure; repair and improve bridges, roads, etc. c. Communication: Awareness raising.

Structural and Non Structural Measures

Structural Measures	Non Structural Measures
Infrastructural measures at the village level. • Flood/drought control: Small scaled river bank improvement, robust irrigation system, etc. • Transportation: Improve inter-village roads and bridges. • Build disaster resilient houses and shelters. • Build safe schools • Disaster resilient public buildings/community centers may be built as possible shelters. • Critical facilities such as hospitals, rescue services, communication networks, etc. may also be built according to relevant building codes and land-use planning.	• Contingency planning: Develop evacuation plans, search and rescue procedures, communication and logistics plans, etc. Some of the plans are discussed in the following section. • Capacity building for communities: Trainings and awareness campaigns for villages; disaster management integrated into education programs for students. • Communication equipment: Provide equipment (loud speaker system, radio, hand speakers). Develop operation and maintenance procedures for disaster preparedness and response equipment. Subsequently, train relevant village personnel.

Content of a CBDRM Action Plan

Normally, a CBDRM plan comprises a number of specific plans and includes the following components:

A. The roles and responsibilities of each stakeholder

B. Disaster preparedness and response activities

The following plans are required to be formulated:

1. Public awareness plan

Raise people's awareness about disasters, their impact and the possibility of minimizing damage and loss through preparedness. Factors to consider include: local literacy; male and female participation; targeted maximum outreach; the transfer of relevant and useful information; available budget and other resources including manpower; timeframe; and, involvement of relevant stakeholders.

2. Early warning systems plan

An effective early warning system contributes much to the reduction of the effects of disasters and the risks that people are exposed to. For this purpose, it is necessary to:

- Identify the means of communication. It is essential that local people recognize warning signals.
- Identify staff responsible for early warning
- Make sure that local people know what to do when they hear or see warning signals.
- Identify preparedness and response activities required to be undertaken for life protection during disasters and people responsible for organizing and monitoring these activities.

3. Evacuation plan

Loss of life will be minimized if evacuation tasks are carried out as required in a timely manner. The following must be identified according to each type of disaster:

- Where and who/what to evacuate?
- Where to evacuate to?

- Safe ways and evacuation routes?
- People responsible for evacuation tasks?

4. Search and rescue plan

Good implementation of search and rescue can reduce risks victims are exposed to and the loss of life. The following must be ensured:

- Well trained search and rescue teams are in place
- Provision of basic equipment to teams involved in search, rescue and evacuation
- Prioritizing areas and procedures during search and rescue to ensure maximum number of survivors
- Coordination with local emergency services, hospitals and facilities to which rescued individuals may be handed over
- Comfort, information and facilitation to the relatives of the people who are missing or have died in the disaster

5. First Aid and medical assistance plan (including establishment of triage)

Minimizing the suffering of casualties depends on timely and effective First Aid. The following must be addressed:

- Identification of trained first aid teams and their timely deployment with essential equipment/material?
- Who will be responsible for establishment of triage?
- Coordination with local emergency services. Are local medical care facilities ready? (e.g. staff, essential medicines/equipment, appropriate means of transport – available and operational)

- What potential diseases/epidemics may occur in the aftermath of a disaster? How are communities prepared for such eventualities?

6. Shelter plan

In some situations, it is necessary to provide temporary shelter for people whose houses were destroyed or are no longer safe. Houses may need to be repaired, plastic sheets and bamboo distributed for people to make temporary shelters in safe places. The following should be considered:

- Who/which organizations are responsible for this?
- How to contact suppliers/vendors of basic necessities and shelter material? How to get to people whose houses are located in safe areas?
- How many households need to be provided with temporary shelters? Where will these shelters be located?
- How to provide basic necessities within temporary shelters (items, their quantity and logistics)?

7. WASH plan

In an emergency situation, fresh water is often in short supply and people may resort to drinking dirty water. Key concerns in water/sanitation plan include the provision of fresh drinking water, areas for human defecation, areas for animal shelter and garbage disposal. The plan should identify:

- People in charge of water/sanitation within local authorities/other organizations and affected communities.
- Safe water sources; guidance for people on how to store, preserve and clean water sources, e.g. the use of alum, chlorine and water filters.

- Treatment methods for waste and the disposal of bodies of animals. The readiness of local health units in terms of human resources, medicines and means to assess the situation, treat water sources and provide temporary sanitation arrangements.

8. Food and foodstuff supply plan

- Who within the local authorities/ other organizations is responsible for assessing the need for food (for people) and foodstuff (for animals) when a disaster strikes?
- What food is available in the local area? What foodstuff/fodders are available?
- For the food distribution plan, it is necessary to identify what capacity is there to distribute? Who/which organization prepares it? Who will implement/monitor it? It is ideal to know the price of each kind of supply (a list of kinds of foods, quantities, prices, suppliers contact details, etc. should be attached)
- How to mobilize support from local people?
- How do local people prepare food reserves themselves? How do they stock fodder/foodstuff for livestock?

9. Communication plan

Efficient communication during disasters is vital. The following should be considered:

- What problems are likely to occur in a worst-case scenario wherein lines of normal communication maybe cut temporarily?
- Availability or timely deployment of communication equipment
- What coping solutions for these problems should be outlined in advance so that higher authorities/other organizations outside disaster areas can be regularly updated on the situation?

10. Logistics plan

A logistics plan is important to ensure well-functioning response activities. The following must be considered:

- Warehouses – capacity and location
- Means of transport and access: What means of transport can be mobilized/easily accessed for search and rescue, emergency relief supply and evacuation? What about beforehand negotiation with transport owners by local CBOs for ensuring availability?
- What other CBOs/NGOs can assist in the supply of relief items needed?

Disaster Risk Management Planning Tools

Planning tools help to develop a more logical and structured plan that ensures the achievement of the DRM vision and objectives, whilst supporting monitoring and evaluation activities. Planning tools include:

1. **Logical Framework (Log Frame)** - It is a table summarizing the main elements of one project and their logical links (inputs, activities, outputs, objectives, indicators, and means of verification).
2. **Gantt Chart** - A graphical illustration of a schedule that helps to plan, coordinate, and track specific tasks in a project.
3. **Action Plan** - This typically includes deciding who is going to do what and by when and in what order, with how much resources, for an organization/a project to achieve its strategic goals.

Participatory Implementation of Disaster Risk Reduction Activities

Purpose

- To enable vulnerable communities to take leadership in reducing disaster risks faced by them and, as a result, own the impact of their activities
- The community participates in implementing DRM activities with effective support and assistance from governmental agencies and external stakeholders

Steps

1. **Create / identify / consolidate community disaster management committees**

   It is necessary to create and/or strengthen existing committees with clear responsibilities for disaster management. These committees should be representative of all factions of the community.

2. **Build capacity**

   It is essential to equip local institutions, vulnerable communities and other stakeholders with disaster risk management knowledge and skills. This includes the following:

   - Training disaster management committees. Improving their knowledge and skills in participatory project management, financial management, resources mobilization, etc.
   - Training emergency response teams in required skills.
   - Training communities, particularly vulnerable groups, to enhance their capacity to prepare for, cope with and mitigate the adverse effects of disasters.

3. Mobilize and allocate resources

Timely mobilization and allocation of adequate human, physical/material, natural and financial resources, is important to ensure the implementation of disaster risk management measures. Resources can be mobilized from external partners and stakeholders as well as local communities.

4. Establish a Coordination Mechanism and Procedures

It is important that standard operating procedures for coordination amongst various community based organizations, government agencies and other stakeholders are established to avoid chaos and duplication of efforts during a disaster situation.

5. Manage Implementation Procedures/Regulations

It is necessary to put in place a transparent process for the tendering and procurement of necessary material. Procedures for capacity building and awareness raising activities must be agreed upon and clearly documented. Standard operating procedures for all activities should be developed.

Participatory Monitoring and Evaluation

Purpose

Progress is reviewed collectively to support decision making and make improvements. Participatory monitoring and evaluation has the following purposes:

- To know whether activities are being completed on time and as per schedule? If not what can be done to bridge the gap?
- To know whether the implemented activities achieved the planned objectives? If not then what can be done to better achieve planned objectives?
- To measure efficiency and impacts of implemented activities.
- To develop a feedback system that encourages regular learning and sharing among communities and stakeholders for better implementation in the future.

Steps

1. **Design an M&E plan and set up an M&E system**
   This entails identifying what information needs to be collected given available human and financial resources; how will this information be collected? Who will collect, analyze, and use the information? Setting up an M&E system with a participatory approach builds stakeholders' understanding about the project and is a great start for creating a learning environment.
2. **Collect data and information**
   Select appropriate methods and tools to gather information, qualitative & quantitative, and individual versus group based, e.g. formal surveys, structured or semi-structured interviews, group discussions, direct observation and case studies. The choice of method depends on the nature and scale of the project, the type of information required, and the frequency, ease and cost of collection.
3. **Analyze data**
   Process, consolidate and analyze qualitative and quantitative data.
4. **Document and share findings**

   This includes reflecting critically (on experience and information) to improve action. Lessons are drawn and best practices are shared with various stakeholders within communities, the government, and NGOs, to promote the CBDRM process and approach.

Tools

M&E tools include

1. Direct observation
2. Interviews with key persons
3. Focus group discussions
4. Questionnaires and surveys
5. Monitoring with specific indicators
6. Log frames have built-in indicators for monitoring and evaluation

CBDRM at Academic Institutions - The School Safety Program

Introduction

The idea of school safety originated at a global level in 2006-2007 when the UN/ISDR Secretariat and UNESCO, with support from the French Government, launched the World Disaster Reduction Campaign under the theme: "Disaster Risk Reduction Begins at School".

This theme was adopted because:

1. It is a follow-up of Priority 3 of the Hyogo Framework for Action 2005-2015: "Use knowledge, innovation and education to build a culture of safety and resilience at all levels."
2. Schools are the most suitable nurseries for breeding a culture of disaster management and making it part and parcel of every citizen's personality.

Philosophy

Real workable safety of people at school is not possible without their systematic participation.

Definition

Using the CBDRM cycle to protect students, teachers and support staff, physically and psychologically from the risks posed by various natural or human induced hazards, by reducing vulnerabilities and building capacities.

Why School Safety?

It is essential for the following reasons:

1. Incorporating disaster resilience in a child's personality means incorporation of Disaster Risk Reduction in the

prevailing culture because children are the best 'Change Agents'.

2. Sensitizing children means social mobilization of three generations, i.e. children themselves, their parents and their kids when they become parents.
3. School safety ensures continuity of education and prevents the loss of an academic session even after a disaster.

School Safety Interventions

Policy Measures

1. Rules, regulations, policies, etc. such as:
   - i. The inclusion of disaster management in school syllabi with special reference to "school safety" in a progressive manner, from junior to senior classes.
   - ii. Making disaster drills a regular activity at school.
   - iii. Making preparedness a criteria for evaluating performance at an individual as well as collective level.
   - iv. Making the availability and appropriate use of disaster response equipment an obligation.
2. Prioritizing the allocation of regular necessary funds for "school safety".

Structural Measures

These interventions include:

- i. Construction of schools at safer places
- ii. Implementation of building codes; constructing a multi-hazard resistant building
- iii. Provision of open spaces in campuses
- iv. Use of flood and fire resistant materials in construction
- v. Installation of multi-hazard safety equipment in the building
- vi. Construction of a ramp for special children.

Non-structural Measures

These involve

i. Preparing, updating and exercising the school disaster management plan

ii. Providing resources and imparting skills to students, teachers and support staff

iii. Promoting preparedness by rehearsing what to do before, during and after various disasters

Important Stakeholders

a. Principal
b. Teachers
c. Students
d. Support Staff
e. Parents
f. Education Department
g. Red Crescent Society
h. Local Emergency Services
i. Local NGOs

Methodology

1. Sensitization:

a) Arrange orientation meetings to discuss:

   i. Hazards the school is vulnerable to
   ii. Risks the students, teachers and support staff are exposed to
   iii. Steps required to reduce risks
   iv. Advantages of mitigation (structural & nonstructural) and preparedness measures
   v. Significance of school safety
   vi. Resources and skills required for school safety

    vii. Who can help?
    viii. What to do before, during and after anticipated disasters?

b) Launch a mass awareness campaign by

    i. Organizing poster competitions on a school safety and display the selected posters on the school notice board
    ii. Organizing quizzes, essay and debate competitions on school safety
    iii. Commemorating the international day for Disaster Reduction on October 13
    iv. Observing disaster prevention week at least once in every academic session
    v. Making use of photo exhibitions, pamphlets, wall paintings, live demonstrations, etc.
    vi. Organizing experience-sharing sessions with disaster management experts

2. Confidence Building

a. Encourage stakeholders to take active part in all interventions of school safety
b. Encourage them to spell out their uncertainties (if any) about school safety
c. Involve them in decision making

3. Partnership Building

Constitute a School Disaster Management Committee in a congenial working environment with the following composition:

Chairman

Principal of the school

Members

Representatives of other stakeholders, i.e. teachers, students, Rescue 1122, PRCS and relevant NGOs.

Wings

1. Awareness raising team
2. Early warning dissemination team
3. Evacuation team
4. Search & rescue team
5. First aid team
6. Site security team

Duties of SDMC

- Execute CBDRM Cycle
- Determine the roles and responsibilities of various wings in what to do before, during and after various disasters, and build their capacity

4. Capacity Building

a) Formulate rules to make the "School Safety Program" compulsory at the institution

b) Provide resources for emergency response

c) Arrange trainings on school safety: how to carry out risk assessment? How to formulate School Disaster Management Plan? How to implement it? How to conduct monitoring and evaluation?

5. Institutionalization

a) Determine the functions, roles and responsibilities of various wings of SDMC
b) Organize TORs of various assignments to economize efforts
c) Formulate and enforce relevant rules, policies and procedures

6. Execution

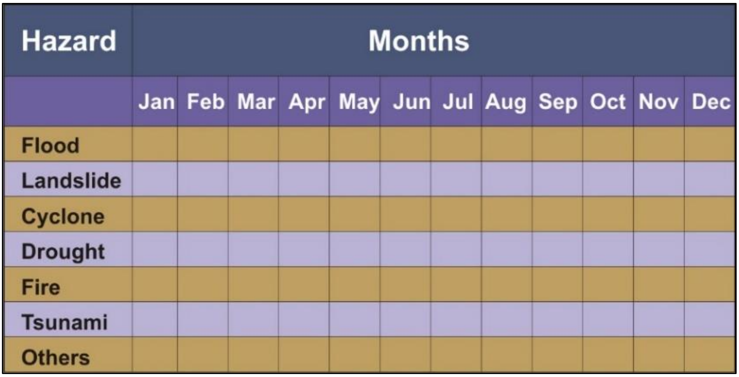
Step 1: Risk Assessment (Risk = Hazard * Vulnerability)

a. Hazard

i. Profile past disasters and their impacts on the school and its surroundings with help from relevant people, i.e. Department of Meteorology and Hydrology (DMH), Government Relief Agencies, Education Department and other government line departments, PRCS and other NGOs.

ii. Identify natural and human induced hazards which have not transformed into disasters in the past but are likely to occur in the future.

iii. Prepare a "Seasonal Calendar" to recognize which hazard usually gets more lethal in which month.



Hazard	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flood												
Landslide												
Cyclone												
Drought												
Fire												
Tsunami												
Others												

iv. Identify minor hazards (inside and outside the school) as well as which turn out to be significant, particularly, when you are managing major disasters.
Minor hazards inside a school may include:
- No or insufficient exits
- No single switch control of electricity, gas, etc.

- Exits locked during working hours
- Doors which open towards the inside only
- Narrow stairs or stairs without railings
- Stampede during break or otherwise
- Heavy cabinets, bookcases, etc. not secured/ bolted to the walls in earthquake prone areas
- Unsecured electric wires
- Unsecured inflammable liquids
- Unsecured playing areas

Minor hazards in the vicinity of a school may include:

- Unsecured electricity transformer and power cables
- Big trees and branches
- Unprotected pits
- Water reservoirs, rivers, lakes, etc.
- Toxic wastes of factories
- Highways, railway lines, etc.

b. Vulnerability

i. Whether building codes have been applied? If not whether retrofitting and reinforcement have been done?

ii. Whether appropriate Early Warning Systems have been installed and are functional?

iii. Whether students, teachers and support staff understand early warning signals and know how to respond?

iv. Whether doors, windows, exits and open spaces are designed to facilitate evacuation in case of an emergency?

v. Whether telephones/mobiles are available with emergency contact numbers pasted on them or stored in them?

vi. Whether emergency response equipment has been provided and people at school know how to use it?

vii. Whether students, teachers and support staff know exactly what to do before, during and after various disasters?

viii. Whether teams working under SDMC have been properly trained?

ix. Whether simulation exercises and mock drills are a regular feature at school?

Step 2: Formulation of School Disaster Risk Reduction Plan (SDRRP)

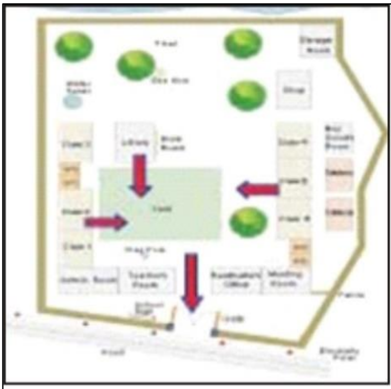
The Plan may include the following chapters:

a. Introduction
b. Hazard and Vulnerability Assessment of the School
c. Names and contact details of the School Disaster Management Committee members and various teams working under it
d. Functions, roles and responsibilities of the committee and teams
e. Training plan for the teams
f. Plan of exercises and drills
g. Do's and Don'ts of various disasters
h. Contact details of local authorities such as Rescue Services, RCS, local hospital and their alternatives, etc.

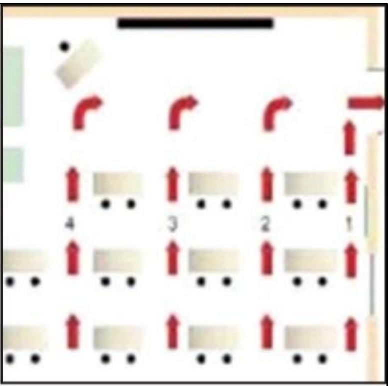
The School Map must clearly include:

i. All physical features i.e. classrooms, laboratories, washrooms, staffroom etc.
ii. Emergency Exits and Evacuation Routes (should be indicated with arrows preferably in red color).
iii. Alternate access routes to the school along with the nearest key infrastructures.
iv. Identified safe place usually known as "Assembly Area" inside and outside school where people from school can be evacuated.
v. Evacuation Maps to show that while getting evacuated which row or column of students shall use which door and in what order depending upon the seating plan.

These Maps must be taught to all students and displayed at various points including class rooms, corridors and reception areas. This will immediately expose the nearest exit and evacuation root to anybody who looks at the maps.



Map 1



Map 2

Step 3: Implementation of SDRRP

a. Build capacity of the SDMC members to implement SDRRP
b. Mobilize and allocate the resources i.e. human, material, technical, financial etc. Arrangements may involve external help from partners and stakeholders.
c. Manage implementation procedures/regulations to uphold quality, transparency and accountability in tendering and procurement of necessary equipment etc.

Step 4: Monitoring and Evaluation

a. Design M & E Plan and setup M & E system; identify what data & information is required to be collected from whom and how, and how will it be consumed to attain the desired results.
b. Collect data and information through group discussions, structured or semi structured interviews, direct observation etc.

c. Analyze data & information in both qualitative and quantitative terms.
d. Document the findings/lessons learnt and share them with stakeholders for updating the SDRRP.

The roles and responsibilities of each team before, during and after a disaster are as follows:

I. Early Warning Dissemination Team	
Time	**Roles and Responsibilities**
Before	• To listen to weather reports on radio or television or read the weather section of the newspaper • To educate students regarding types of warning (ringing style of the bell, etc) in case of a disaster • To ensure warning devices are functioning (school bell, megaphones, etc), and are preferably manual • To ensure that at least two members of the team are always available to give warning signals, whenever required • To be able to use notice boards to give information regarding early warning signs • To keep contact details of the local offices of the Department of Meteorology and Hydrology, Fire Services Department, Hospital, PRCS, etc.
During	• To raise alarm in a pre-decided manner • To use the school bell, megaphones (if any), to pass information • To inform security personnel to open all exit routes, if not open • To switch off the power supply, if required

After	• To check, if any student is still in need of help • To assist the school authority in informing the parents of affected students • To ask everyone to be alert, if there is a possibility of the disaster striking again or a secondary disaster

II. Evacuation Team	
Time	**Roles and Responsibilities**
Before	• To be aware of the warning signal • To ensure that evacuation routes are clearly indicated • To ensure that exit doors are open and free of obstruction • To take a headcount of students in each class • To ensure that students do not panic if a disaster strikes • To prepare a team to meet such eventualities in the best possible manner • To organize and practice mock drills in consultation with other teams and the SDMC
During	• To ensure that students come out in single file in case of evacuation • To check that all students are out of classrooms in case of evacuation • To identify students who will assist the physically challenged in evacuation • To see that students maintain discipline during evacuation

	• To act fast if the situation calls for that • Depending on the type of disaster, to ask students to stand in places, where there is less danger like corners, underneath tables, away from electric points, etc.
After	• To check if anybody still needs to be evacuated • To take help from the Search and Rescue Team, if needed • To allow the re-entry of students after an all-clear signal is given

III. Search and Rescue Team	
Time	**Roles and Responsibilities**
Before	• To train members of the team in basic search and rescue • To prepare a detailed map of the school with different exits, stairs, doors and windows clearly marked • To see whether the school bus or any other vehicle can be made available at school during and perhaps after school hours • To ensure availability of sand bags in the school, preferably in classrooms • To ensure the fire system is functional, if available • To ensure emergency windows in every class, if possible • To ensure fire hooks, ropes, etc. are in the school

During	• To "Drop, Cover and Hold on" (DCH) at the first sign of an earthquake • If outside, move away from buildings, trees, electric polls, etc. • To assist the physically challenged in case disaster strikes • Assist the Evacuation Team
After	• To check every room/class in the building • To report the location of injured persons to the First Aid Team • To report any damages to the SDMC

IV. First Aid Team	
Time	**Roles and Responsibilities**
Before	• To keep a First Aid kit in a convenient and easily accessible place with proper labeling • To check the First Aid kit periodically and ensure its contents are complete • To be trained on how to give first aid, use bandages and what to do in case of an emergency • To seek the help of doctors, paramedical staff, RCS, Fire Brigade, and other NGOs to generate awareness among students about First Aid in case of emergencies like electric shocks, lightning, food poisoning, snake bites, inhaling of poisonous gas, earthquakes, etc.

	• To be trained in giving artificial respiration(CPR) to victims in emergencies • To disseminate information on health, hygiene, different ailments, etc. amongst the students
During	• To arrange for the immediate assembly of team members available and pass instructions quickly • To provide First Aid to injured students • To provide drinking water, glucose, etc. as required by victims • In case of excessive bleeding, to be able to use bandages and send victims to a nearby hospital with the help of other team members and the SDMC • To avoid giving medicines without knowledge
After	• To assist in shifting affected students to a hospital • To give psycho-social care, if possible • To seek the help of a local doctor and other authority to deal with an emergency depending on its type and intensity • To assist the SDMC in informing parents of affected students
V. Site Security Team	
Time	**Roles and Responsibilities**
Before	• To identify an assembly point for evacuation based on the type of disaster, for example, in case of a

	fire, an open space, and in case of a flood or tsunami, the first floor • To ensure that proper exit routes are available and functional in the buildings • To ensure stairs and corridors are free of any obstruction • To ensure that all students and teachers are aware of the assembly point
During	• Guide students to vacate and assemble at the pre-determined site through the pre-planned route • To take care that no stampede or chaos is created during evacuation • To assist the Evacuation Team
After	• To undertake headcount at the assembly point to ensure that all have been evacuated • To assist the First Aid and Search and Rescue Teams

VI. Awareness Generation Team	
Time	**Roles and Responsibilities**
Before	• To organize awareness activities with the SDMC • To organize debates, poster competitions, quizzes and other extra–curricular activities on disaster management themes • To paste do's and don'ts of disasters on notice boards and other visible locations • To form a Disaster Management Club on the lines of a Nature Club or a Science Club

	• To invite Fire Services Department, DMH, PRCS, and other NGOs for talks on disaster preparedness with the help of the SDMC • To put up newspaper clippings or articles on disaster management on notice boards • To observe "International Day for Disaster Reduction" on October 13, every year
During	• To assist other Disaster Management Teams and the SDMC
After	• To assist other Disaster Management Teams and the SDMC • To draw lessons from past disasters and identify measures for improvement in school disaster preparedness and response techniques

Mock Drill

A mock drill should be organized at least once each term. For one drill, students can be informed well in advance and the other can be a surprise. After each mock drill, an evaluation should be done to upgrade the School Disaster Management Plan.

The Preparation of Mock Drill

- Maps of classrooms, the school and its surroundings, pictures or site plans with evacuation routes should be displayed. The school evacuation map should also be placed in each classroom and in other common places where it can be seen easily.

- The School Disaster Management Committee and Teams should study the School Disaster Management Plan carefully and make sure that they understand all aspects of the plan.

- The Early Warning Dissemination Team must decide on the mode of alarm and educate all persons about it (bell, megaphone, etc.)
- The Evacuation Team must designate the assembly point and evacuation routes according to the type of disaster. For example when a fire occurs inside the school, then going out side is safe.
- All staff and students must know what they have to do once they hear the alarm.
- Parents must be made aware of the process so they do not interfere in the safe evacuation of students.
- Agencies such as the Police Force, local administration, Fire Brigade, etc. must be informed of the mock drill and sometimes asked to be present during the drill.

Key Considerations

- Ensure that all students leave the classroom after the headcount.
- In the classroom, all persons must line up, form a queue, and gather at the outdoor assembly area or safe area. No one will run, turn back or shout. This is important to prevent panic and a stampede.
- If there are injured students who are unable to leave on their own, the teacher should ask for help from others to take them out of the classroom.
- The class teacher must be the last to leave the room, and walk together with the students.
- At the safe area, there should be a headcount. If any person is missing then the information must be given to the school administration, and the Search and Rescue Team.
- The last to leave the premises should be the principal and senior staff. They can lock any valuables before leaving, if the situation permits.
- If there is a need to evacuate outside the school premises, then the school administration must get the help of the traffic police,

especially at junctions, to enable safe crossing of roads by children.

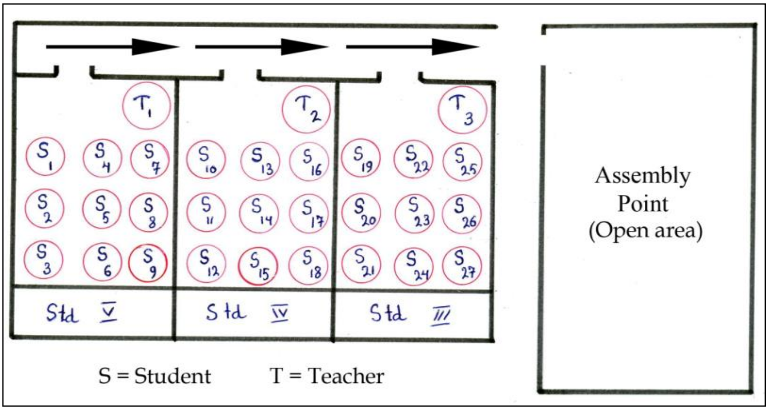
- It is important to take feedback from all participants to improve the School Disaster Management Plan from time to time.

In case of an emergency, the following are essential steps that should be practiced during mock drills:

- As soon as an emergency occurs students and staff should be informed by the Early Warning Dissemination Team.
- Initial steps should be taken to control the emergency, e.g. fire extinguishing, using available resources.
- At the same time, the warning should be immediately followed by an evacuation led by the Evacuation Team.
- If there is a trained Search and Rescue Team, it should conduct a head count and search for missing persons.
- The First Aid Team should treat victims on the spot, at a pre-designated first aid post.
- After first aid operations, victims should be rushed to the nearest hospital as soon as possible, if necessary.
- Fire Services Department and Police should be informed immediately.
- The situation should be handled calmly by the SDMC and all teams. Students should be kept calm and controlled by their teachers.
- The Site Security Team should prevent any person from running into a disaster site.
- Future measures should be discussed with the participation of the school community.

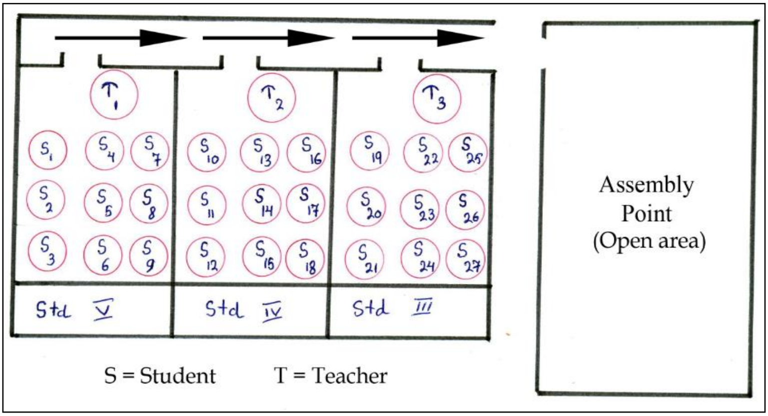
General Steps in Evacuation

The following diagram shows a classroom with one exit. T indicates Teacher and S indicates Student.



Step I

On hearing the alarm bell, the Teacher or Class Monitor should move near the door of the class.



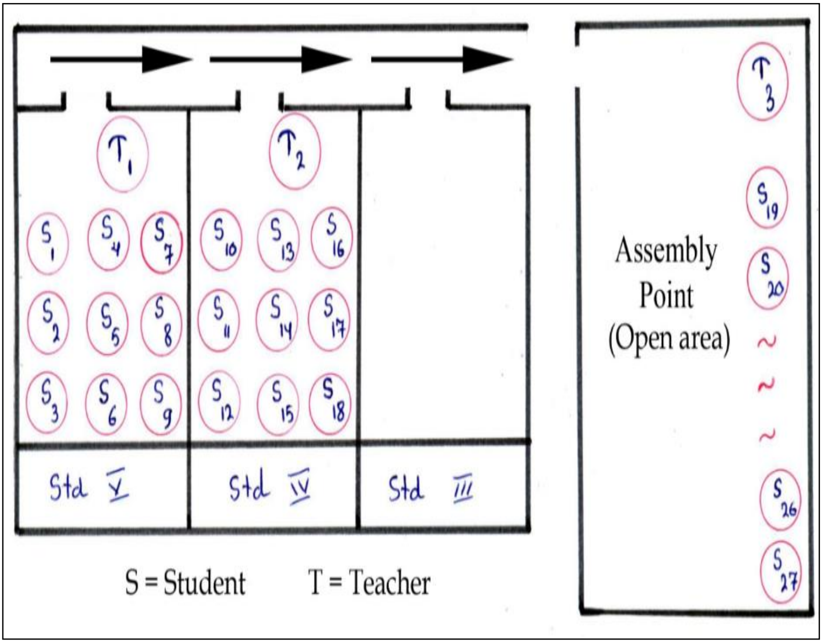
Step II

i. Students should be evacuated first.

ii. The class nearer to the exit should move out first.

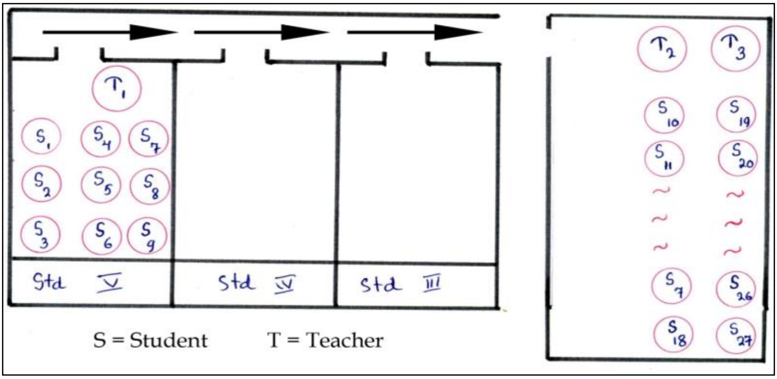
iii. The column near the exit door of the class should move first. In this case, S19, S20, S21 will move first, followed by S22, S23, S24, S25, S26, and S27 will move out to assemble at the pre-defined Assembly Point.

iv. Teacher (T3) will be the last to leave the class, that is, after student (S27).



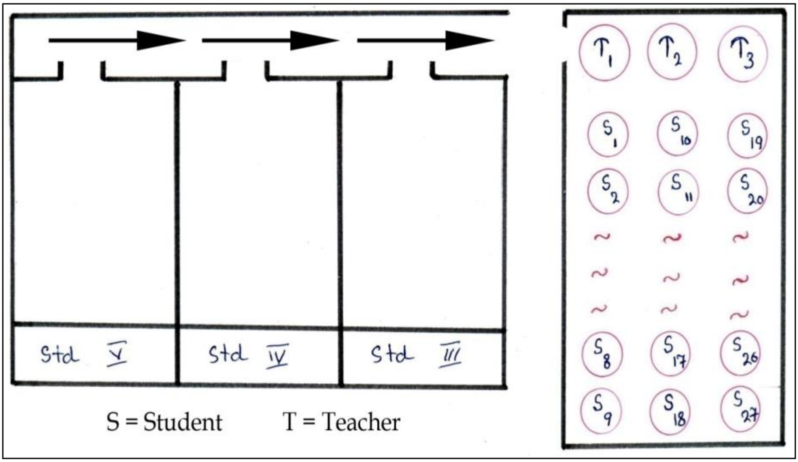
Step III

The next class, that is, Standard IV will be evacuated after Standard III. It will follow the same process which Standard III followed (refer Step II).



Step IV

After evacuation of Standard IV, Standard V will move out and assemble at the pre-defined Assembly Point. It will also follow the same process which Standard III and Standard IV followed. (Refer to Step II and III).



Step V

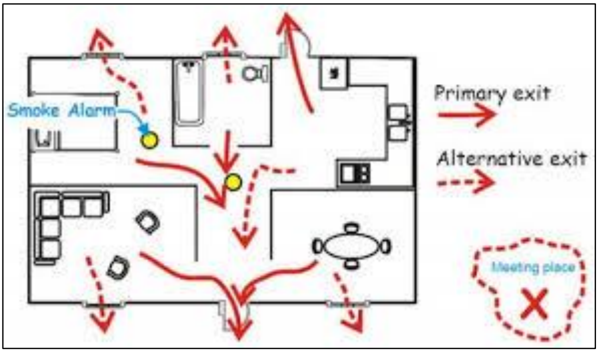
The headcount should be done to ensure that all have been evacuated.

What to do Before, During and After Various Disasters?

Earthquake

Before an Earthquake

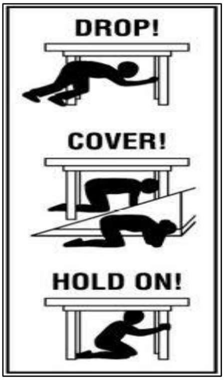
- Give awareness talks on disaster management
- Set an internal early warning system and make people conversant with the warning signals
- Conduct regular inspections of buildings to see whether they are earthquake resistant
- Ensure the availability of appropriate emergency response equipment
- Keep a first aid box and emergency kit handy
- Plan and practice what to do before, during and after the disaster
- Conduct trainings on formation and execution of evacuation plan, search & rescue, and first aid



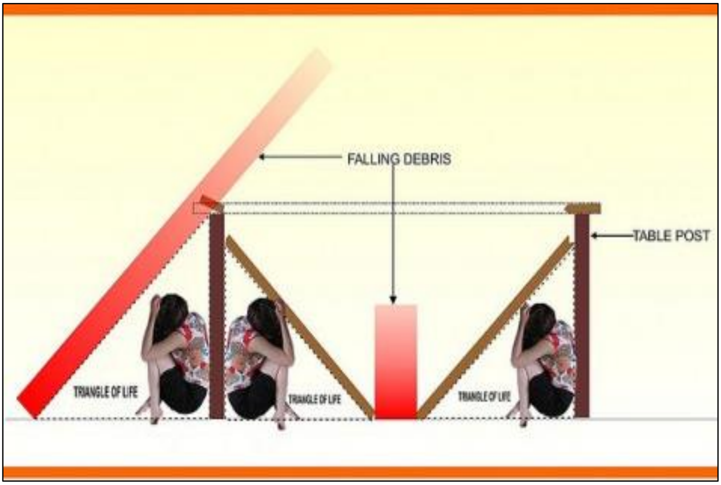
- Display the exit plan in the building on notice boards
- Display exit signs on each floor
- Install single switch controls at easily accessible points and let everyone know where it is

- Paste emergency phone numbers at every phone
- Identify Safe Places
    - Under sturdy furniture
    - In a doorway
    - Under a staircase
    - Against an inside wall
    - Away from where glass could shatter around, i.e. windows, mirrors, pictures
    - Away from where heavy furniture or bookcases or anything else could fall over
- Make sure that doors of conference halls and other gathering places open both ways
- Identify an Emergency Assembly Area

During an Earthquake


DROP!
COVER!
HOLD ON!

- Do not run and do always remember that most of the damage is caused by falling objects around you
- Find shelter in already identified safe places
- No matter where you are, remember three steps;
    1. DROP down onto your hands and knees
    2. COVER your head and neck
    3. HOLD ON to your shelter until the earthquake stops
- Try to utilize the “Triangle of Life”; the roof does not usually fall straight, it rather makes a triangle with the floor and inside wall, which is a safe place, as shown in the figure.



- Don’t panic, stay calm
- If you don’t find a sturdy object, crouch near an inside wall preferably the corner (try to be in a curled up position to protect your head, neck & spine)
- If no other option is available, cover up your face and head with your hands and lie on the floor

If you are Outside

- Lie down as far away as possible from buildings, trees, power lines and anything that could fall
- If driving, stop the vehicle and stay in it until the shaking stops
- If you are in a mountainous area, be aware of landslides which usually occur in areas where there are no trees
- Turn on the radio for emergency broadcast information

After an Earthquake

- Evacuate the building at the earliest following the evacuation plan
- Switch off gas and electricity supplies through single switch control to avoid any secondary disaster
- Be safe and move smart
- Watch out for ruptured pipes
- Avoid pooled water, it could be electrically charged
- Stay away from damaged areas
- Expect secondary shockwaves which can occur even weeks and months after the quake
- Gather at already identified safe places (open ground/ emergency assembly areas)
- Call Rescue Services

EMERGENCY
ASSEMBLY
POINT
Prospectimages.com.au

BE HONE

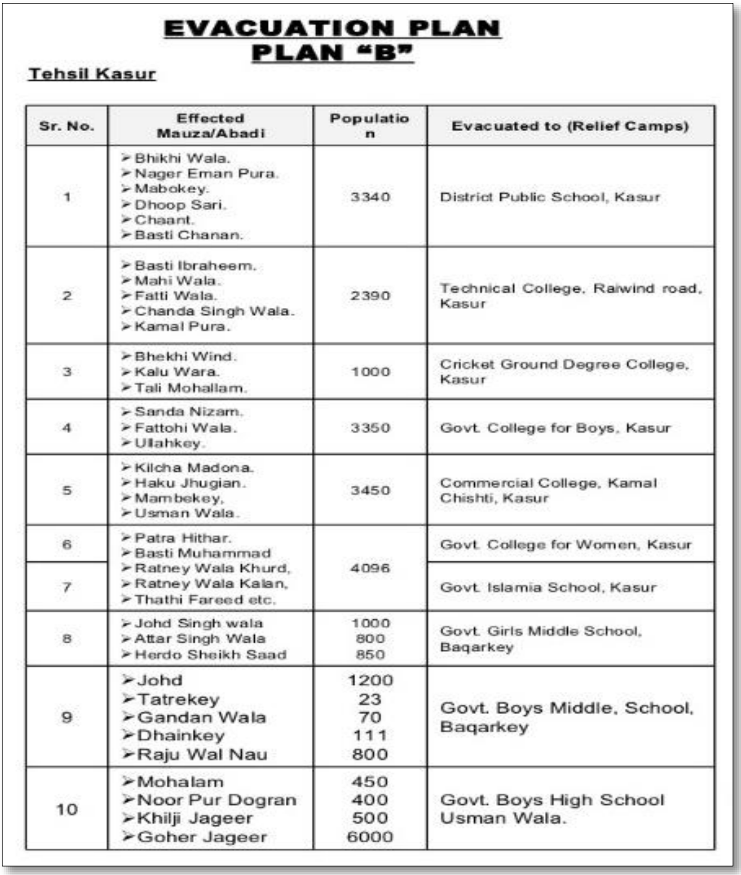
If trapped under debris;

- Do not light a match. There may be gas leakages
- Cover your airways with a piece of cloth (a torn piece of shirt can serve the purpose) and do always remember that a number of people die because of suffocation caused by the dust of fallen buildings
- Do not move about or kick up dust. You might cause more physical damage to yourself
- Once you feel that the earthquake has stopped, tap on pipes or walls to alert rescuers
- Use a whistle if you have one but do not whistle on your own, chances are you might choke on the smoke and dust
- Shout only as a last resort

Flood

Before a Flood

- Promote awareness on floods and their management
- Carry out Risk Assessment to know whether you live in a flood-prone area
- Do not construct your houses near a river/unsafe areas. Contact local authorities for support



EVACUATION PLAN
PLAN "B"

Tehsil Kasur

Sr. No.	Effected Mauza/Abadi	Population	Evacuated to (Relief Camps)
1	➢Bhikhi Wala. ➢Nager Eman Pura. ➢Mabokey. ➢Dhoop Sari. ➢Chaant. ➢Basti Chanan.	3340	District Public School, Kasur
2	➢Basti Ibraheem. ➢Mahi Wala. ➢Fatti Wala. ➢Chanda Singh Wala. ➢Kamal Pura.	2390	Technical College, Raiwind road, Kasur
3	➢Bhekhi Wind. ➢Kalu Wara. ➢Tali Mohallam.	1000	Cricket Ground Degree College, Kasur
4	➢Sanda Nizam. ➢Fattohi Wala. ➢Ullahkey.	3350	Govt. College for Boys, Kasur
5	➢Kilcha Madona. ➢Haku Jhugian. ➢Mambekey, ➢Usman Wala.	3450	Commercial College, Kamal Chishti, Kasur
6	➢Patra Hithar. ➢Basti Muhammad ➢Ratney Wala Khurd, ➢Ratney Wala Kalan, ➢Thathi Fareed etc.	4096	Govt. College for Women, Kasur
7			Govt. Islamia School, Kasur
8	➢Johd Singh wala ➢Attar Singh Wala ➢Herdo Sheikh Saad	1000 800 850	Govt. Girls Middle School, Baqarkey
9	➢Johd ➢Tatrekey ➢Gandan Wala ➢Dhainkey ➢Raju Wal Nau	1200 23 70 111 800	Govt. Boys Middle, School, Baqarkey
10	➢Mohalam ➢Noor Pur Dogran ➢Khilji Jageer ➢Goher Jageer	450 400 500 6000	Govt. Boys High School Usman Wala.

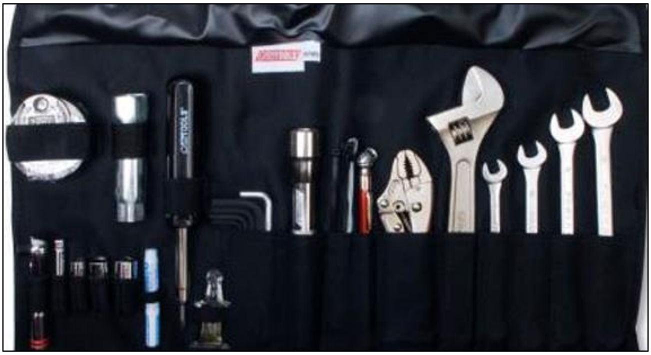
- Prepare an emergency evacuation plan

  Learn the emergency plan, warning signals, evacuation routes, and locations of emergency shelters.
- Plan and practice the flood emergency evacuation routes.
- Ask a relative or friend that lives in another area to be the "family contact" in case your family is separated during a flood. Make sure everyone in your family knows the name, address, and phone number of this contact person.
- Paste emergency phone numbers at every phone.
- Inform local authorities about any special needs, i.e., elderly or anyone with a disability.
- Identify potential home hazards and know how to secure or protect them before the flood strikes.
- Secure structurally unstable building materials.
- Buy a fire extinguisher and make sure your family knows where it is and how to use it.
- Buy and install sump pumps with back-up power.
- Have a licensed electrician to raise electric components (switches, sockets and wiring) at least 12" above your home's projected flood elevation.
- For drains, toilets, and other sewer connections, install backflow valves or plugs to prevent floodwaters from entering.
- Anchor fuel tanks which can contaminate water if torn free.
- Prepare an emergency toolkit
  - Water for 3 days, one gallon per person per day

- Water filtration tablets
- Food, at least a three-day supply of non-perishable food
- Battery-powered radio with extra batteries
- Flashlight with extra batteries
- First aid kit
- Whistle to signal for help
- Five feet cane
- Dust mask, plastic sheeting and duct tape

  - Towels, garbage bags and plastic ties for personal sanitation
  - Wrench or pliers to turn off utilities
  - Manual can opener for food
  - Local maps
  - Cell phone with chargers

- Once you have gathered the supplies for a basic emergency kit, you may want to consider adding the following items:
  - Prescription medications and glasses
  - Infant formula and diapers
  - Cash
  - Sleeping bags or warm blankets



  - Family documents and identification records in a waterproof, portable container
  - Locally available emergency reference material and local maps
  - Rubber boots, sturdy shoes, waterproof gloves, long-sleeved and long-legged clothing
  - Household chlorine bleach and medicine dropper (you can treat water by using 16 drops of regular household liquid bleach per gallon of water)
  - Fire extinguisher
  - Lighter or matches in a waterproof container
  - Feminine supplies and personal hygiene items
  - Paper cups, plates, paper towels and plastic utensils
  - Paper and pencil

Under a Flood Watch or Warning

- Fill your vehicle's fuel tank and make sure the emergency kit is ready.
- If no vehicle is available, make arrangements with friends or family for transportation.
- Fill your clean water containers.
- Be alert and listen to radio/ TV for updates.
- Listen for disaster sirens and warning signals.
- Avoid going to river sides to witness the flood.
- Put livestock and family pets in a safe area. Due to food and sanitation requirements, emergency shelters do not accept animals.

During a Flood

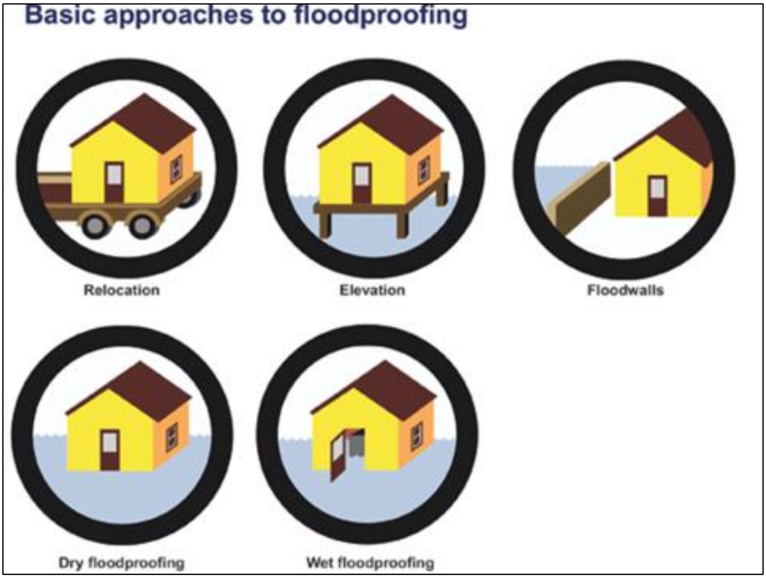
- Be alert.
- Monitor your surroundings. Use radio, TV, Web, etc.
- Don’t drive unless you have to.
- Follow recommended routes.
- Use a five feet cane while walking through water.

- Avoid disaster areas. Your presence might hamper rescue or other emergency operations and put you at further risk.
- If water rises around your car or it stalls, leave the vehicle immediately.
- Do remember that vehicles can be swept away by less than 2 feet of moving water.
- Get to high ground; climb to safety.
- Evacuate immediately, if you think you are at risk or are advised to do so.
- Act quickly. Save yourself, not your belongings.
- Stay away from power lines and electrical wires.
- Shut off water, gas, and electrical services before leaving.
- Secure offices and home: lock all doors and windows.
- Use minimum vehicles to avoid getting separated and reduce traffic jams.
- If directed to a specific location, go there.
- Avoid trying to walk or swim through flowing water.
- Do not forget that if flowing water is above your ankles, STOP! Turn around and go another way.
- If it is moving swiftly, water 6 inches deep can knock you off your feet.
- If someone is trapped in a flood, throw something to help him float, such as a spare tire, large ball, etc.
- Call Rescue Services.

After the Flood

- Your office or home is no longer a safe place.
- Do not enter a flooded building until it has been inspected for safety.
- Pump out flooded basements gradually to avoid structural damage.
- Watch out for snakes and other insects.
- Throw away medicine, food, or water that had contact with floodwaters.
- If water is of questionable purity, use bleach or water purification tablets or boil drinking water for 10 minutes.
- Keep windows and doors open for ventilation.

- When making repairs
    - Follow flood building codes.
    - Use flood-resistant materials and techniques.



Global Warming

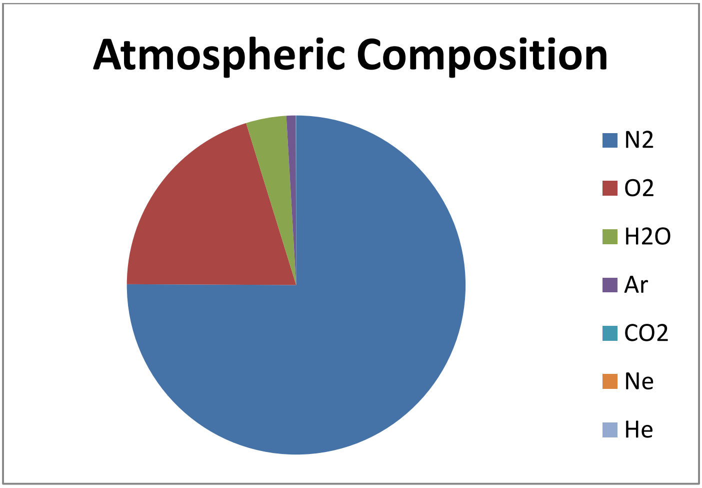
What is Global Warming?

It is a gradual increase of the Earth's temperature because of energy trapped by Greenhouse gases present in Earth's atmosphere.

What is Earth's Atmosphere?

It is a layer of gases surrounding the planet Earth that is retained by Earth's gravity. The common name given to the atmospheric gases used in breathing and photosynthesis is air. The average composition of the atmosphere up to an altitude of 25 km is as under:

Gas Name	**Chemical Formula**	**Percent Volume**
Nitrogen	N_2	78.08%
Oxygen	O_2	20.95%
*Water	H_2O	0 to 4%
Argon	Ar	0.93%
*Carbon Dioxide	CO_2	0.0360%
Neon	Ne	0.0018%
Helium	He	0.0005%
*Methane	CH_4	0.00017%
Hydrogen	H_2	0.00005%
*Nitrous Oxide	N_2O	0.00003%
*Ozone	O_3	0.000004%



What are Greenhouse Gases?

Greenhouse gases are those that exist in our atmosphere and are responsible for the retention of heat by the atmosphere. Greenhouse gases have the tendency to absorb and emit infrared radiation (heat) through Greenhouse effect. They are

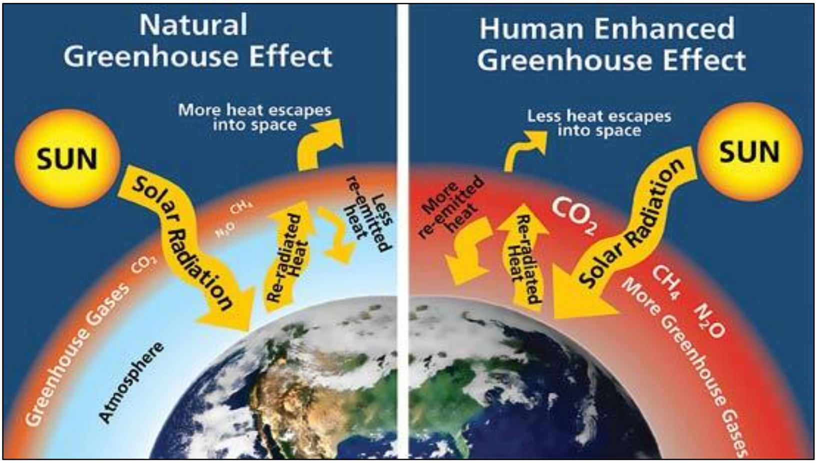
- Carbon dioxide (CO_2)
- Methane ($CH4$)
- Nitrous oxide ($N2O$)
- Water vapor ($H2O$)
- Ozone ($O3$)
- CFCs

What is the Greenhouse Effect?

The retention of heat by the atmosphere is called the Greenhouse Effect. It occurs naturally but can be enhanced by human activity.

The greenhouse effect is a process by which thermal radiation from a planetary surface is absorbed by atmospheric greenhouse gases, and is re-radiated in all directions.

Since a part of this re-radiation is back towards the surface and the lower atmosphere, it results in an elevation of the average surface temperature above what it would be in the absence of the gases.



Greenhouse Effect and Earth

Earth is a rare planet to have a moderate Greenhouse effect which is essential to support the complex patterns of life.

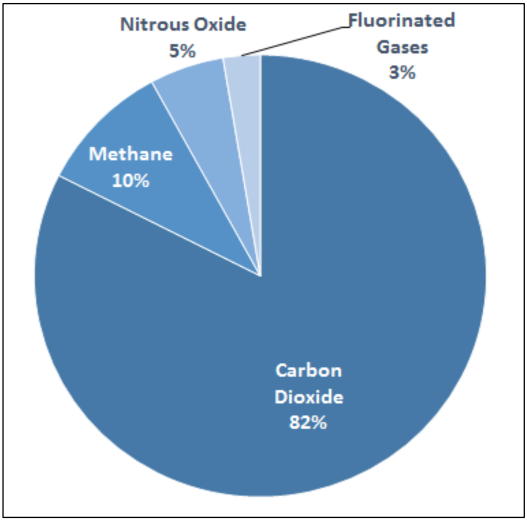
Planets with very little greenhouse effect are too cold for survival of life. For instance Neptune's Mean Surface Temperature is -200.15 C (-328.27° F).

Planets with abundant greenhouse gases are too hot to live on, as in the case of Venus where the average temperature is about 456.85 C (854.33° F).

The Ranking of Greenhouses Gases

Greenhouse gases ranked by their direct contribution to global warming:

- Carbon Dioxide 82%
- Methane 10%
- Nitrous Oxide 5%
- Fluorinated Gases 3%



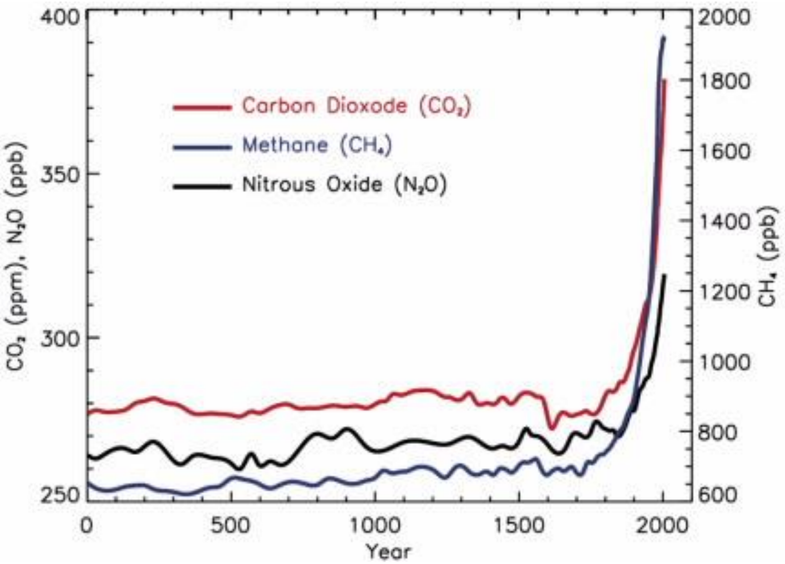
Fluorinated gases are four types:

1. Hydrofluorocarbons (HFCs)
2. Perfluorocarbons (PFCs)
3. Sulfur Hexafluoride (SF_6)
4. Nitrogen Trifluoride (NF_3)

The Current Episode of Global Warming

It is attributed to increasing emissions of greenhouse gases, CO_2 in particular, into Earth's atmosphere because of the human-induced interferences.

As per the data for past 2000 years, the increase in global annual mean concentrations of CO_2, CH_4, and N_2O – three important long-lived greenhouse gases – have increased substantially and dramatically since 1750.



Source: Figure 1, FAQ 2.1, IPCC Fourth Assessment Report (2007), Chapter 2

This increase is an outcome of a comparison between emissions of these gases from human activities and natural systems and their removal from the atmosphere by conversion to different chemical compounds--for example, removal of CO_2 by photosynthesis and conversion to carbonates.

According to the United States Environment Protection Agency (EPA), figures of increase in green house gas concentrations since industrial revolution (as of 2016) are as under:

- CO_2 has increased by more than 40% (The present concentration is the highest in at least the past 800,000 years).
- CH_4 has increased by about 250% (more abundant in Earth's atmosphere now than at any time in at least the past 800,000 years).
- N_2O has increased approximately by 20% (more rapidly during the past century than at any time in the past 22,000 years).

Human-Induced Interferences

Industrialization

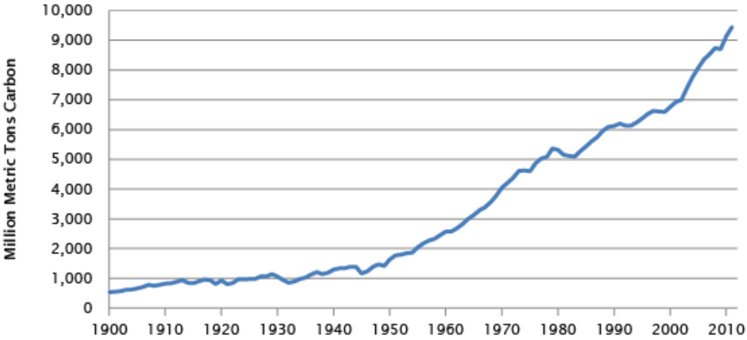
According to an estimate provided by the Energy Information Administration, 86.4% of the global energy requirement by 2007 was met from fossil fuels:

Petroleum 36.0%
Coal 27.4%
Natural gas 23.0%,

Fossil fuels contain high percentages of carbon. Other more commonly used derivatives of fossil fuels are kerosene and propane.

The burning of fossil fuels is the major reason for increase in Greenhouse Gas Emissions, carbon dioxide in particular. The use of these non-renewable sources of energy produce around 21.3 billion tons of carbon dioxide per year whereas the natural process can absorb only about half of this amount, which implies a net increase of about 10.65 million tons of atmospheric carbon dioxide per annum.

The following graph highlights tends in global carbon emissions from fossil fuels:

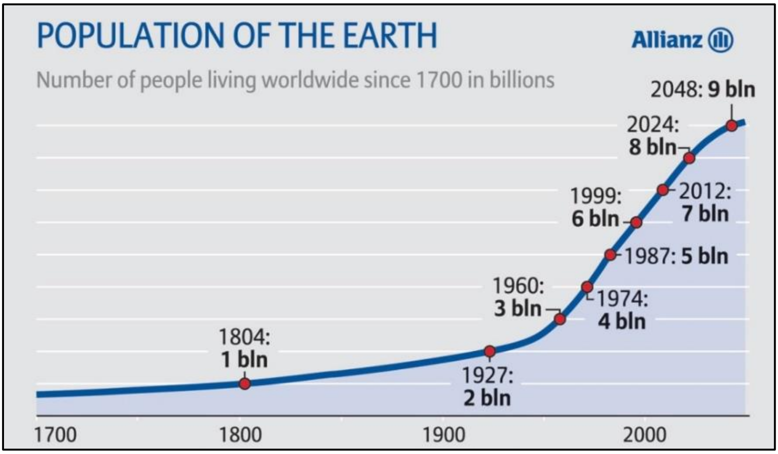


Source: Boden, T.A., Marland, G., and Andres R.J. (2015). Global, Regional, and National Fossil-Fuel CO2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, doi 10.3334/CDIAC/ 00001_V2015.

There has been a major increase in global carbon emissions since 1900 in general and since 1970 in particular because of the excessive use of fossil fuels.

Explosion of Population

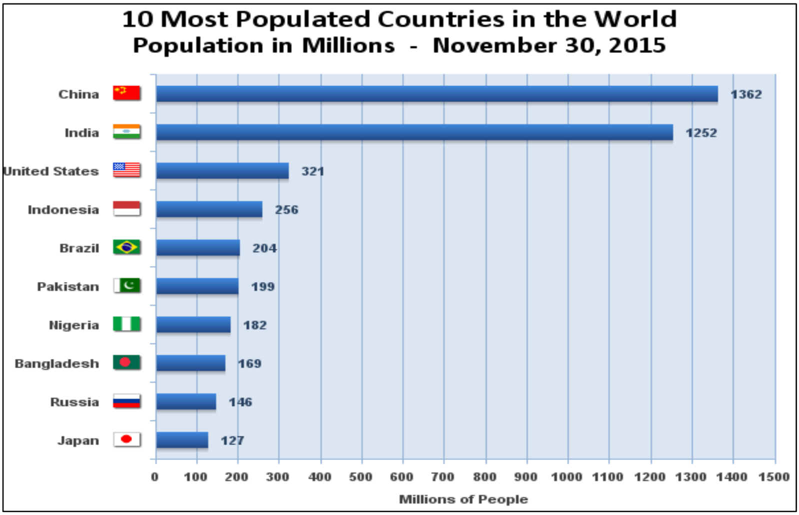
The world population has risen from 2 billion to an alarming 7 billion during the last 100 years or so.



Source: United Nations World Population Prospects, Deutsche Stiftung Weltbevolkerung For further information please visit: www.knowledge.allianz.com

More people mean more requirements for energy and more utilization of carbon emitting fossil fuels to meet that requirement. More people also mean more breathing wherein oxygen is inhaled and carbon dioxide is released by human beings.

To add insult to injury, deforestation and forest degradation have decreased the planet's natural carbon sink as trees are major agents that extract carbon dioxide from the atmosphere and release oxygen therein, through the process of photosynthesis.



Source: Internet World Stats – www.internetworldstats.com/stats8.htm 7,259,902,243 world population estimated for November 30, 2015. Copyright © 2016, Miniwatts Marketing Group

Deforestation & Forest Degradation

In broader terms "Deforestation" is the clearing of trees, transforming a forest into cleared land, and "Forest degradation" is a reduction in the capacity of a forest to produce ecosystem services such as carbon storage and wood products.

According to World Wildlife Fund (WWF), deforestation has caused an estimated loss of 13 million hectares of forests between 2000 and 2010.

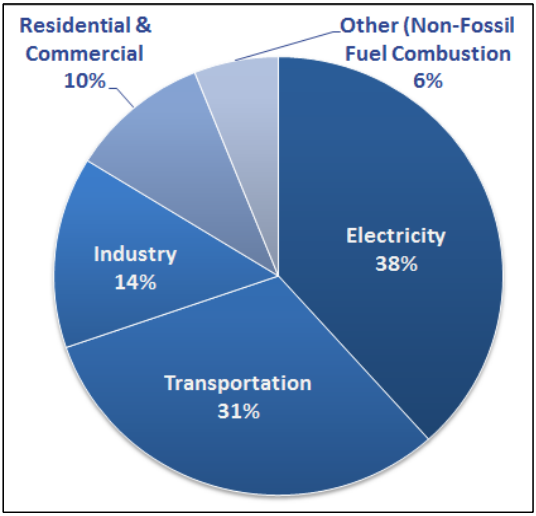
And as per the Intergovernmental Panel on Climate Change (IPCC), deforestation and forest degradation are the second leading causes of human-induced greenhouse emissions following fossil fuel combustion, accounting for over 15 to 17% of global carbon dioxide emissions.

Following are the highest deforestation countries in the world:

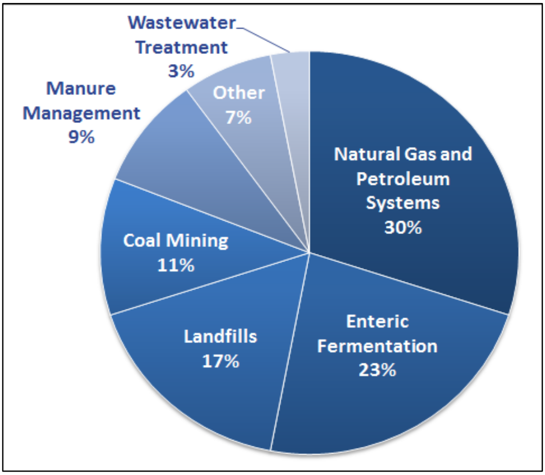
Deforest Rank	Country Name	Forest Area Cut(in Hectares)
1	Brazil	3466000
2	Indonesia	1447800
3	Russian Federation	532200
4	Mexico	395000
5	Papua New Guinea	250200
6	Peru	224600
7	United States of America	215200
8	Bolivia	135200
9	Sudan	117807
10	Nigeria	82000

Greenhouse Gas Emissions by Source

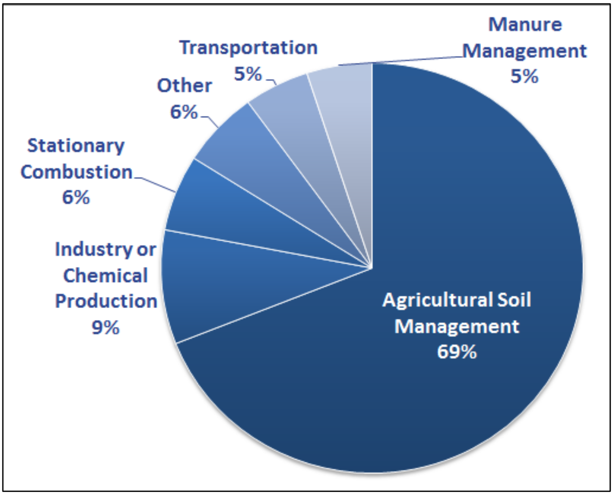
Carbon dioxide:



Methane:



Nitrous Oxide:



Transportation

The movement of people and goods by cars, trucks, trains, ships, airplanes, and other vehicles is included in transportation sector. The burning of fossil fuels in internal combustion engines results in the release of Greenhouse gases.

Electricity

The generation, transmission and distribution of electricity are included in this sector. Greenhouse gases are released during the combustion of fossil fuels, such as coal, oil, and natural gas to produce electricity.

Residential and Commercial Activities

These activities contribute to greenhouse gas emissions in the following ways:

- Combustion of fossil fuels for heating and cooking needs.
- Organic waste sent to landfills.
- Wastewater treatment plants.

- Fluorinated gases (mainly hydrofluorocarbons, or HFCs) used in air conditioning and refrigeration systems can be released during servicing or from leaking equipment.

Industrial Activities

The goods and raw materials we use every day are included in this industrial sector. The greenhouse gas emissions from this sector are split into two categories:

1. Direct emissions:
   These emissions are produced at the facility by burning of fossil fuels for power or heat, through chemical reactions. A smaller amount, roughly a third, come from leaks from natural gas and petroleum systems, the use of fuels in production (e.g., petroleum products used to make plastics), and chemical reactions during the production of chemicals, iron and steel, and cement.
2. Indirect emissions:
   These emissions occur off site, but are associated with the facility's use of energy. These are produced by burning fossil fuel at a power plant to make electricity, which is then used by an industrial facility to power industrial buildings and machinery.

Enteric Fermentation

This is a digestive process by which carbohydrates are broken down by microorganisms into simple molecules for absorption into the bloodstream of an animal.

Manure Management

This refers to the capture, storage, treatment, and utilization of animal manure in an environmentally sustainable manner. It can be retained in various holding facilities. Animal manure (also referred to as animal waste) can occur in a liquid, slurry, or solid form.

Wastewater Treatment

This is a process to convert wastewater - which is water no longer needed or suitable for its most recent use - into an effluent that can be either returned to the water cycle with minimal environmental issues or reused.

Coal Mining

This is the act, process, or industry of extracting coal from the earth.

Natural Gas & Petroleum Systems

This refers to the production, processing, storage, transmission, and distribution of natural gas with methane as its primary component. Because gas is often found alongside petroleum, the production, refinement, transportation, and storage of crude oil is also a source of CH_4 emissions.

Landfill

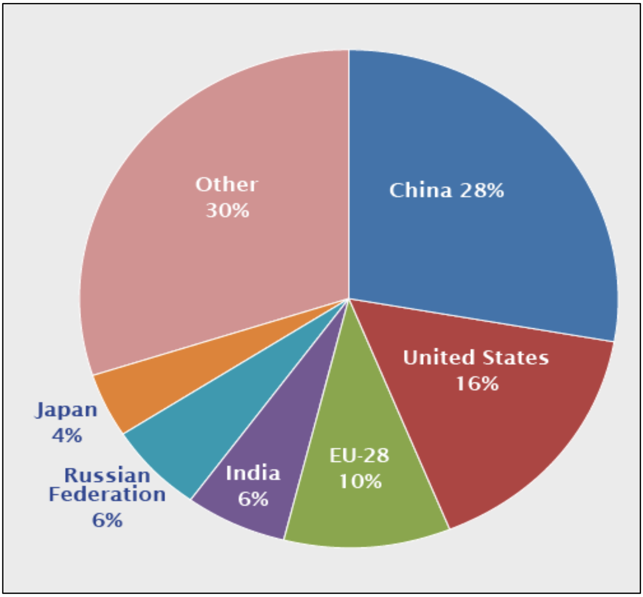
Also known as a tip, dump, rubbish dump, garbage dump or dumping ground, a landfill is a site for the disposal of waste materials by burial and is the oldest form of waste treatment.

Agricultural Soil Management

This concerns all operations, practices, and treatments used to protect soil and enhance its performance. The use of synthetic fertilizers containing nitrogen to attain the objective is responsible for greenhouse gas emissions.

The following pie chart reflects 2011 global carbon dioxide emissions from fossil fuel combustion and some industrial processes by country.

1. China
2. United States
3. European Union
4. India
5. Russian Federation
6. Japan
7. Canada



Source: Boden, T.A., Marland, G., and Andres, R.J. (2015). National CO_2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2011, Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, doi 10.3334/CDIAC/00001_V2015.

Impacts of Global Warming

In the context of Disaster Management a discussion on global warming; the phenomena, its impacts and what can be done in an individual and collective capacity; is especially important because the increasing intensity and frequency of natural disasters has been attributed to global warming. Global warming is the deadliest predicament man is confronted with. The plague and, even the worst episodes of famine around the world, pale in comparison to the foreseeable impacts of global warming. Scientists claim that the adverse effects of global warming are so great that they cannot be compared to the fallout of any war fought in the past or any global nuclear war in the future.

STERN Report

The Stern Review on the Economics of Climate Change is a 700-page report released for the British government on 30 October 2006 by economist Nicholas Stern. The report discusses the effect of global warming on the world economy. It is the largest and most widely known and discussed report of its kind.

According to the report, the benefits of concerted, early action significantly outweigh the costs. At the current rate, climate change could cost the world at least 5% of GDP each year. If dire consequences of climate change come to pass, the cost could exceed 20% of the world's GDP. Stern emphasizes the need to reduce carbon dioxide emissions by shifting the world onto a low carbon path, charging people for carbon intensive goods while simultaneously investing in low carbon technologies, an industry worth more than $500 billion.

The Stern Review pointed to a 75% chance that global temperatures would rise between two and three degrees above the long-term average. In 2013 Nicholas Stern said publicly that he had underestimated the risks and that he now believes that the world is on track for a four degree rise in temperature.

The impacts of global warming are not based on speculations and weak probabilities. In fact, the scientific community has been able to measure and quantify precisely what will happen if temperatures rise as a direct consequence of global warming. Below is a brief account of the known impacts of global warming.

In the Event that the Earth's Temperature Rises by 0.8°C

Heat Waves

Locally, what seems like a small increase in average temperature can cause relatively large increases in the number of extremely hot days, increasing the likelihood of "killer" heat waves during the warm season (Karl et al., 1997). The number of days per year that temperature thresholds for mortality are surpassed has increased significantly over the last 50 years for some US cities (Gaffen and Ross, 1998). 2000-2009 has been the hottest decade of the earth in recorded history. Increased heat waves due to climate change would cause more heat-related illness and death. A severe heat wave with temperatures as high as 49 °C (120 °F) struck southern Pakistan in June 2015. It caused the deaths of about 2,000 people from dehydration and heat stroke, mostly in Sindh province and its capital city, Karachi.

Ocean's Warming

The atmosphere affects oceans, and oceans influence the atmosphere. As the temperature of the air rises due to global warming, oceans absorb some of this heat, becoming warmer - rising ocean temperatures accelerate the overall warming trend – creating a vicious cycle. The world's oceans are warmer now than at any point in the last 50 years. Warmer oceans put coastal communities at risk, increase infrastructure costs by increasing the need for cooling, endanger polar creatures and threaten coral reefs and fisheries. Many fish species have moved toward the poles in response to ocean warming, disrupting fisheries around the world. Rising sea levels, partly the result of heat absorbed by the ocean, are also "drowning" coastal areas.

Ocean Acidification

Ocean acidification and global warming are related, because both are caused by CO_2. The ocean is the earth's largest carbon reservoir, containing more than 50 times as much CO_2 as the atmosphere. As more man-made CO_2 has entered the atmosphere, more of the gas has entered the ocean. The ocean has absorbed about 30 percent of the carbon dioxide humans have sent into the atmosphere since the start of the Industrial Revolution – some 150 billion tons.

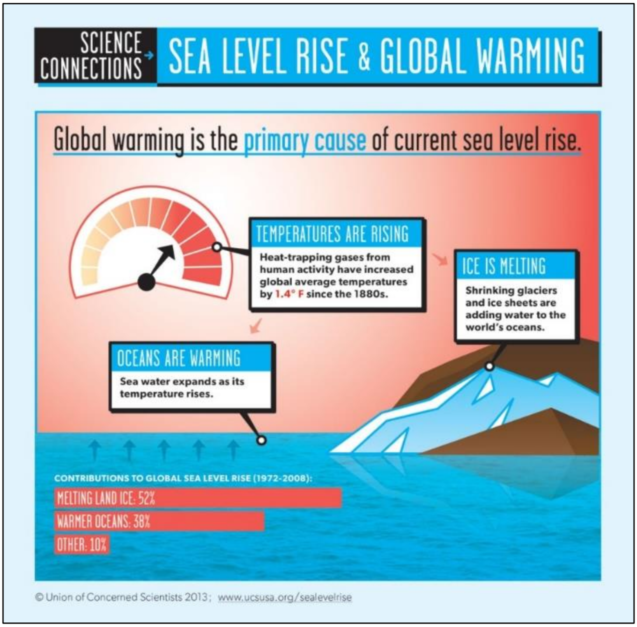
The uptake of excess CO_2 comes at a high cost — ocean acidification. As acidity levels increase, many plant and animal species as well as entire eco systems in oceans are being threatened.

Arctic Ice Cap Melting

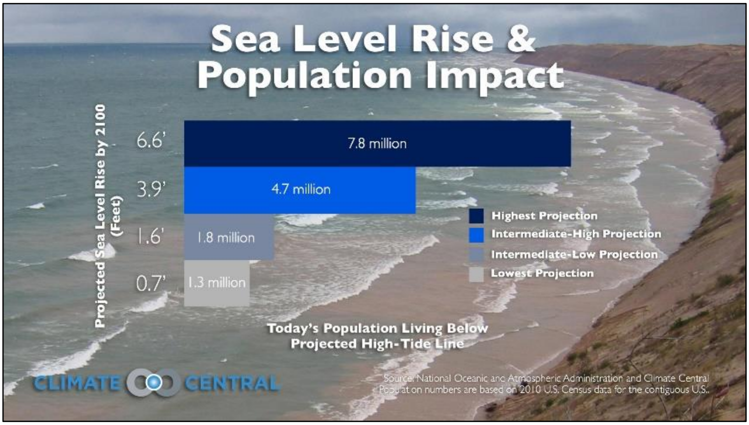
Unlike Greenland and Antarctica, which are "ice caps" on top of solid land; the Arctic ice is floating in the sea. Although significant melting in the Arctic will not affect sea levels, other serious adverse effects are likely. In the Arctic, warming is occurring faster than the global mean. From 1978 to 2004, ice cover in the Arctic declined by 7.8 percent each decade. If these trends continue, late-summer sea ice could disappear from the Arctic as early as 2030. Interestingly, due to its light color, Arctic sea ice reflects most of the sunlight that reaches it, back into space. In contrast, dark ocean water absorbs most of the sunlight. As sea ice continues melting, it can cause further warming, leading to more ice melt and reinforcing the melting cycle. The animal most vulnerable to sea ice melt is the species at the top of the Arctic food chain, the polar bear, which hunts primarily on sea ice. Penguins in the Antarctic are also affected by the disappearance of sea ice.

Rising Sea Levels

When water warms, it expands and takes up more volume. This is called thermal expansion. Sea levels are rising worldwide both from thermal expansion and from the addition of water from inland glaciers, which are melting at accelerating rates. Melting ice caps in Greenland and West Antarctica are also contributing to rising sea levels. Rising sea level is a threat to people who live near the ocean. Some low-lying areas will have more frequent flooding, and very low-lying land could be submerged completely. Rising sea level can also harm important coastal ecosystems like mangrove forests and coral reefs. A rising sea level can also contaminate drinking water; interfere with farming; change coastal plant life; threaten wildlife populations e.g. endangered sea turtles whose nests may be swept away by coastal flooding; hurt the economy as tourism and real-estate industries in coastal areas take a hit when prime beachfront properties and recreational areas are washed away by rising waters.


SCIENCE CONNECTIONS
SEA LEVEL RISE & GLOBAL WARMING
Global warming is the primary cause of current sea level rise.
TEMPERATURES ARE RISING
Heat-trapping gases from human activity have increased global average temperatures by 1.4° F since the 1880s.
ICE IS MELTING
Shrinking glaciers and ice sheets are adding water to the world's oceans.
OCEANS ARE WARMING
Sea water expands as its temperature rises.
CONTRIBUTIONS TO GLOBAL SEA LEVEL RISE (1972-2008):
MELTING LAND ICE: 52%
WARMER OCEANS: 38%
OTHER: 10%

© Union of Concerned Scientists 2013; www.ucsusa.org/sealevelrise



Source: National Oceanic and Atmospheric Administration and Climate Central
Population numbers are based on 2010 U.S. Census data for the contiguous U.S..

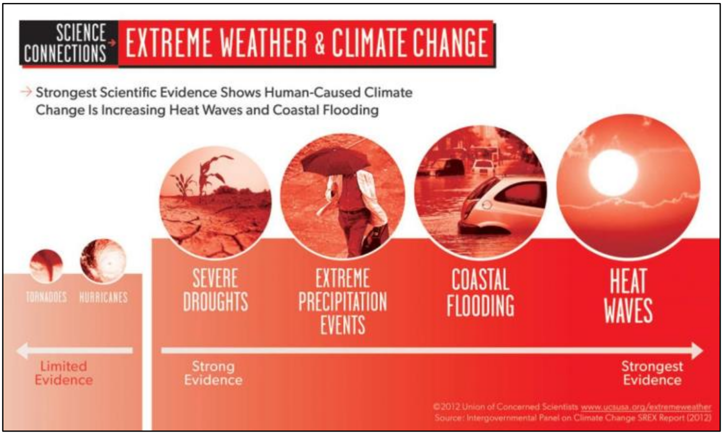
Species Extinction

When temperatures rise as a result of global warming certain species struggle to survive. Global warming is also causing dangerous changes to the landscape of our world, adding stress to wildlife species and their habitat. Recent studies quote that one out of six and in some cases one out of thirteen species faces extinction as a result of climate change and urgent action must be taken to save large numbers of animals from being wiped out. Species extinction today can only be described as explosive. The extinction of the golden toad of Central America has been attributed to climate change as a result of global warming. The orange spotted filefish, the quiver tree, the polar bear, the Adelie Penguin, the North Atlantic cod and coral worldwide are some endangered species. The Indus River Dolphins of Pakistan are among the world's most endangered dolphins. Populations are threatened by declining freshwater supplies, pollution, capture in fishing nets and hunting. The problem is further exacerbated by climate change - reduced glacial cover and weakening monsoon rains in northern Pakistan are predicted to dramatically reduce Indus River discharge within 50 years. Declining river flows have been highlighted as perhaps the greatest threat to the long-term survival of the Indus River dolphin.

Extreme Weather Events

Extreme weather events, as a result of global warming, have claimed hundreds of thousands of lives, destroyed physical infrastructure and ripped societies of decades' worth of development gains and, in doing so, are effectively drawing attention to global warming and the urgent need to take action against it.

Global warming is making hot days hotter, rainfall and flooding heavier, hurricanes stronger and droughts more severe.



©2012 Union of Concerned Scientists www.ucsusa.org/extremeweather
Source: Intergovernmental Panel on Climate Change SREX Report (2012)

Pakistan suffered from 21 major floods between 1950 and 2011 — almost one flood every three years. These floods killed a total of 8,887 people, damaged or destroyed 109,822 villages, and caused economic losses amounting to $19 billion. On an average, the annual flood damage from 1960 to 2011 was about one per cent of the mean annual GDP. The extent of the destruction caused by the 2010 floods is hard to comprehend.

Increased Earthquakes

The idea that global warming can produce a wave of formidable seismic shocks, a resurgence of volcanic activity, tsunamis and massive landslides seems, at first, to be ill founded. However, scientific evidence suggests otherwise. When glaciers melt, as a result of global warming, massive weight on the Earth's crust is reduced, and the crust “bounces” back. This process has the potential to reactivate faults, increase seismic activity, and lift pressure on magma chambers that feed volcanoes. It is important, also, to understand that not every volcanic eruption and earthquake in the years to come can be linked to global warming.

There are implications for all parts of the world where glaciers and active faults coincide, including the Alps, Himalayas, Rocky Mountains, Andes and the Southern Alps in New Zealand. Scientists are particularly concerned with the continental shelf around Greenland, where the melting of a massive ice sheet might trigger earthquakes strong enough to cause underwater landslides, which in turn could generate tsunamis. Moreover, with rising sea levels, previously exposed coastal areas may be submerged in water. Geological history shows that this extra load has the potential to reactivate faults and trigger earthquakes around the rims of all major ocean basins, and also set off giant landslides on the sea floor.

In the Event that the Earth's Temperature Rises by 1 °C

Coral Reefs Destroyed

Coral reefs are colorful and fragile ecosystems that provide food and shelter to thousands of marine species, thereby supporting the fishing industry, and the tourism industry which thrives on providing people with unforgettable scuba diving and snorkeling experiences. Coral reefs are often referred to as rainforests of the sea because of their rich biodiversity. These reefs also act as a natural protective barrier for coastal regions by forming a breakwater against storm surges.

Although reefs represent less than 0.1 percent of the world's ocean floor, they help support approximately 25 percent of all marine species. As a result, the livelihoods of 500 million people and income worth over $30 billion are at stake.

Corals are living organisms themselves. They form when polyps (the living portion of stony corals) extract calcium from seawater and combine it with carbon dioxide to construct elaborate limestone skeletons that form the reef. Their composition makes them especially sensitive to variations in temperatures and acidity levels of the ocean.

If water temperatures stay higher than usual for many weeks, the colorful algae – zooxanthellae, they depend on for some of their food leave their tissue. Without zooxanthellae, corals turn white because zooxanthellae give corals their color. White, unhealthy corals are called bleached. Bleached corals are weak and less able to combat disease. Some coral are able to recover, but too often the coral dies, and the entire ecosystem for which it forms the base, virtually disappears.

Sea level rise caused by melting sea ice and thermal expansion of the oceans could also cause problems for some reefs by making them too deep to receive adequate sunlight, another factor important for survival.

Ocean acidification, as discussed earlier, occurs when oceans absorb carbon dioxide from the atmosphere. As the oceans become more acidic, corals are unable to form skeletons through calcification, causing their growth to slow. A doubling of atmospheric carbon dioxide will reduce calcification in some corals by as much as 50 percent.

In 1998, a huge underwater heat wave triggered by the El Nino of that year, killed 16% of the corals on reefs around the world. The second global bleaching event struck in 2010. The US National Oceanic & Atmospheric Administration (NOAA) announced the third global bleaching event in October 2015 and it has already become the longest event recorded, impacting many reefs. This prolonged bleaching event is not just the result of warm water flowing around the Pacific Ocean, but also global warming caused by man-made greenhouse gas emissions.

Almost 93% of reefs on the Great Barrier Reef, off the coast of Australia, have been hit by coral bleaching. Scientists say this episode is the worst they've ever seen.

Before – Healthy Coral

After – Bleached Coral

Species Extinction

15-40% of all species will face extinction if temperatures rise by 1-2°C. Amongst other animals, today polar bears are an endangered species due to the ongoing and potential loss of their sea ice habitat resulting from climate change. They were listed as a threatened species in the US under the Endangered Species Act in May 2008. The survival and the protection of the polar bear habitat are urgent issues.

Island Nations Underwater

Climate change may still seem far off for some, but for the people of the island nations of Fiji, Tuvalu, Kiribati, Vanuatu, and the Marshall Islands, it is already a disturbing reality.

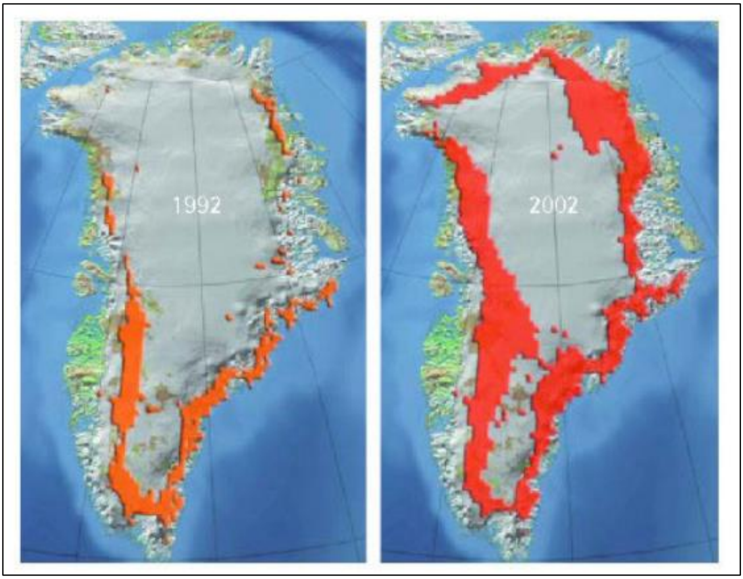
In recent years, cyclones, droughts, and other natural disasters have become commonplace for these Pacific island nations, as well as several other nations. If sea levels continue to rise at their current rates, some of the islands will be fully submerged within just a few decades, according to a UN report released at the UN Climate Change Conference in Paris. Kiribati, a nation of 105,000 people in the central Pacific, could be overtaken by the ocean in as little as 50 years.

In the Event that the Earth's Temperature Rises by 2 °C

Greenland Melts

There are two ice sheets on Earth today, covering most of Greenland and Antarctica. Together, the Antarctic and Greenland ice sheets hold more than 99 percent of the freshwater ice on Earth. Greenland's ice cap contains 10% of the world's supply of fresh water and is now melting with increasing speed.

Greenland ice sheet melting is a visible sign of global warming from the burning of fossil fuels because it is causing sea levels to rise, putting coastal areas at risk. If the entire Greenland ice sheet melted, which would take centuries, it could add 20 feet or more to global sea level. At the current rate, the Greenland ice melt alone could raise sea level by a couple of feet. From 1979 to 2006, summer melt on the ice sheet increased by 30 percent, reaching a new record in 2007. In some parts, an increase in winter snow accumulation has partially offset the melt. However, the melting continues to outpace snow accumulation because warmer temperatures have led to increased melt and faster glacier movement on the edges.



Seasonal surface melt extent on the Greenland ice sheet has been observed by satellite since 1979 and shows an increasing trend. The melt zone where summer warmth turns snow and ice around the edges of the ice sheet into slush and ponds of melt water has been expanding inland and to record high elevations in recent years (source: Arctic Impacts of Arctic Warming, Cambridge Press, 2004).

Water Supply Affected

Climate change is threatening water availability, access, and even quality for the following reasons:

- One effect of rising temperatures is to increase the amount of water that the atmosphere can hold, which in turn can lead to more and heavier rainfall when the air cools. Although more rainfall can add to fresh water resources, heavier rainfall leads to more rapid movement of water from the atmosphere back to the oceans, reducing our ability to store and use it.

- An intensification of the water cycle means extreme rainfall events and flooding as a result of which sewer systems may overflow, gushing untreated sewage into drinking water supplies.
- Loss of mountain snow caps and earlier spring snowmelt spurred by higher temperatures reduce the availability of drinking water downstream.
- Global warming affects the movement of water into the atmosphere from land, water surfaces and plants due to evaporation and transpiration. This is expected to lead to reduced rainfall and increased drought in dry areas and the expansion of dry areas i.e. semi-arid and desert areas are expected to expand.
- The shrinking of mountain glaciers threatens drinking water supplies for millions of people. The melting of inland glaciers will increase water supply to rivers and lakes in the short to medium term, but this will cease once these glaciers have melted.
- Sea-level rise can lead to saltwater intrusion into groundwater drinking supplies, especially in low-lying, gently sloping coastal areas.

In the Event that Global Warming Causes the Earth's Temperature to Rise by 3 °C

Environmental Refugees

A striking phenomenon of climate change is climate-induced displacement. Climate refugees are people who must leave their homes and communities because of the effects of climate change and global warming. Climate refugees belong to a larger group of immigrants known as environmental refugees.

Environmental refugees include people forced to flee because of natural disasters, such as earthquakes, volcanoes and tsunamis.

Rising sea levels as a result of global warming can put land completely underwater, making it uninhabitable. Rising temperatures also lead to droughts and desertification—the transformation of arable land to desert, making it impossible for people in the region to support themselves and thus forcing them to look for a home elsewhere.

According to the United Nations High Commission for Refugees (UNHCR) 36 million people were displaced by natural disasters in 2009, the last year such a report was taken. Scientists predict this number will rise to at least 50 million by 2050. Some say it could be as high as 350 million. The July 2010 floods in Pakistan left 8 million homeless compelling them to relocate, some temporarily and others permanently.

Food Shortages

Half of the world's population could face severe food shortages by the end of this century as rising temperatures shorten the crop growing season, increase the risk of drought, and reduce the harvests of dietary staples such as rice and maize by 20 percent to 40 percent, according to a scientific study. Drought is one of the most significant impacts of climate change on food. Global warming is expected to affect agriculture in every part of the world but it will have greater impact in the tropics and subtropics, where crops are less able to adapt to climate change and food shortages are already starting to occur due to rapid population growth.

According to UN's Intergovernmental Panel on Climate Change (IPCC), we are risking an imminent breakdown of food systems which can be attributed to global warming, drought, flooding, and precipitation variability and extremes. Climate change threatens the way food gets produced around the world, which can drive up the price of food. By 2040, food prices will be four times higher than they were in 2000. Already, they're already twice as high as they were in 2000. In the event of a total failure to take action, the global food supply system will face catastrophic losses, and an unprecedented wave of food riots, and global food insecurity.

Here's how global warming affects our food:

- A warming planet leads to less food. According to IPCC's 2014 report, every decade of warming decreases the amount of food the world can produce by 2%, or 4.4 million metric tons of food.
- Droughts cut back on the food produced.
- Flooding decreases the amount of land available for farming.
- More frequent extreme weather causes damage to lands making it harder to have a reliable crop yield and a steady supply of food, thus driving up prices.

Despite sufficient national food production to meet the needs of Pakistan’s 180 million people, food security has been deteriorating. The number of food insecure individuals is on a rise. According to the World Food Program (WFP), almost half of Pakistan’s population was food insecure in the year 2010. These numbers swelled after the 2010 unprecedented floods that submerged almost one-fifth of the country’s total landmass.

Amazon Disappears

The Amazon rainforest is a repository of ecological services not only for local communities, but for the rest of the world. It is also the largest tropical rainforest that we have left in terms of size and diversity. Protecting the Amazon Basin is critical to our planet's climate stability.

The rainforest serves as one of Earth's largest reservoirs of carbon dioxide, helping regulate global climate patterns through the absorption and storage of 20% of carbon dioxide emitted by the burning of fossil fuels and other natural and manmade activities. In doing so rainforests can help mitigate climate change substantially. Moreover, as the source of one-fifth of all fresh water on the planet, the Amazon Basin plays a critical function in regulating global and regional climate. Water condensation, evaporation, and transpiration over the Amazon are key drivers of the global atmospheric circulation, affecting precipitation across South America and much of the Northern Hemisphere. The Amazon's important contributions to global weather are at risk. The Amazon serves as a carbon sink only so long as the rainforest absorbs more carbon dioxide than it releases which could soon change if patterns continue.

Global warming is affecting the Amazon. More than half of the Amazon rainforest could be lost or severely damaged as early as 2030 if current trends in deforestation, droughts, forest fires and global greenhouse gas emissions continue. A new study to investigate how the Amazon would respond to future temperature rises, found that a 2 degree centigrade rise, widely considered the best case global warming scenario, would still see 20-40% of the Amazon die off within 100 years. A 3 degree rise would see 75% of the forest destroyed by drought over the following century, while a 4 degree rise would kill 85% of the Amazon. This will have further catastrophic effects on the climate - creating a vicious cycle, a dangerous 'feedback loop'. The Amazon is a huge store of locked-up carbon. When the forest is cut and burnt or left to rot, carbon is released, contributing to climate change. Deforestation globally is responsible for up to 20% of global greenhouse gas emissions.

Regional rainfall will be affected too. Rainforests transform the sun's energy into water vapor and generate clouds and rain. When Amazon rainforests are lost, less water is released into the atmosphere, and fewer clouds form. That could lead to droughts and crop failures - not just in the Amazon but the world over.

In the Event that the Earth's Temperature Rises by 4 °C

Permafrost Melts and Gases Released

Permafrost is permanently frozen soil, and occurs mostly in high latitudes. Permafrost comprises 24% of the land in the Northern Hemisphere, and stores massive amounts of carbon. As a result of climate change, permafrost is at risk of melting, releasing the stored carbon in the form of carbon dioxide and methane, which are powerful heat-trapping gases. Scientists believe that at least 500 billion tons of carbon are waiting to be released from the Arctic ice, though none yet has put a figure on what it will add to global warming. In addition, permafrost is structurally important, and its melting has been known to cause erosion, disappearance of lakes, landslides, and ground subsidence. It will also cause changes in plant species composition at high latitudes. When permafrost melts, the land above it sinks or changes shape. Sinking land can damage buildings and infrastructure such as roads, airports, and water and sewer pipes. It also affects ecosystems. For example, the photo on the right shows a forest where the trees are leaning or falling over because the permafrost underneath them has melted. The photo on the left shows infrastructure being affected by the melting of permafrost.

Bangladesh Underwater

According to a scientific report by the World Bank Group, global warming has turned Bangladesh into a "potential impact hotspot" threatened by "extreme river floods, more intense tropical cyclones, rising sea levels and very high temperatures" that will adversely impact food production, livelihoods, and infrastructure as well as slowing the country's efforts to reduce poverty. The report warns that 20 to 30 years from now, shifting rain patterns could leave some areas under water and others without enough water for power generation, irrigation or drinking.

Bangladesh is an extremely low-lying country - a few meters above sea level. Saltwater intrusion into the south-west of the country is already poisoning groundwater supplies. At the present rate of sea level rise, it could take just 25 years for encroaching saltwater to waterlog farmland and poison fresh drinking water for as many as 10 million people. The forecasted rise of one meter before the end of the century could permanently displace more than 30 million people. Bangladesh also lies right in the pathway of massive cyclones, the rate and intensity of which have recently began to increase due to global warming. With agriculture as a key economic driver, Bangladesh is extremely reliant on a predictable pattern of monsoon rains that feed the country's rich soils. However, in recent years, the monsoon has been arriving weeks earlier than expected, making it difficult for farmers to know when to plant and harvest crops. The fisheries sector has also experienced an adverse effect because of the impacts of climate change. There are around 260 species of fish in the country and almost all the varieties are sensitive to specific salt and freshwater conditions. About 75% area of mangrove forest, the Sundarban, will be submerged if the sea level rises up to 45cm. If the sea level rises over 1 meter, the whole mangrove forest will be submerged under water.

Various health problems and diseases will increase due to climate change. Frequent floods and cyclonic storm surges are contaminating water resources and increasing water borne diseases such as cholera, diarrhea, etc. Some other diseases like hepatitis-B, meningitis, polio are also on the rise. Rising temperatures will increase dengue, malaria, etc. The most troubling social aspect of climate change that Bangladesh confronts is climate migration. So far, most of the migration has taken place internally from rural areas to cities with several million spilling over into India. Migrants have no choice but to live in the crowded slums of the capital, Dhaka. This situation will be exacerbated when, 50 years from now, 15% of the country goes underwater and rich farmlands along the southern coast can no longer feed its massive population.

Millions of Refugees

It is predicted there could be as many as 200 million climate refugees by 2050, according to the International Bar Association. "Hundreds of millions, probably billions, of people would have to move if you talk about 4, 5, 6 degree increases" in the Earth's median temperature, British economist Nick Stern predicted in 2009.

A random survey of 30,000 people in Pakistan, Nepal, India, Bangladesh, China, Vietnam and Indonesia by the Environmental Justice Foundation found that 68% of them believe they are likely to face extreme weather events. Even more - 87% - said that changes in the weather and resulting changes in access to food and water would have a significant impact on them, forcing them to leave their homes for good.

In the Event that Temperatures Rise by 5-6°C

In this case the Earth will be hotter than it has been in 55 million years. In these circumstances most of the world will become uninhabitable.

Mass Extinction

Today global warming is accelerating species loss on Earth, and by the end of this century, as many as one in six species could be at risk of extinction. This phenomenon has been called the sixth mass extinction, at par with the catastrophic demise of the large dinosaurs 65 million years ago. These effects are being seen around the world, though the threat is much higher in certain sensitive regions. Unlike past mass extinctions, caused by events like asteroid strikes, volcanic eruptions, and natural climate shifts, the current crisis is almost entirely caused by humans. In fact, 99 percent of currently threatened species are at risk from human activities, primarily those driving habitat loss, introduction of exotic species, and global warming. If greenhouse gas emissions continue unabated 16% of species will be threatened with extinction due to global warming and climate change by the end of the century. Extinction risk does not just increase with temperature rise, but accelerates, curving upward as the Earth warms.

Massive Tsunamis

The link between global warming and tsunamis is not far fetched but, in fact, self evident. When ice is lost, as a result of rising temperatures, the earth's crust bounces back up again and that triggers earthquakes, which trigger submarine landslides, which cause tsunamis. Scientists portend massive tsunamis in the event that the Earth’s temperature rises by 5°C.

Today, unprecedented glacier melting has spawned an increase in massive water surges known as "Himalayan tsunamis" that are causing vast destruction in Himalayan communities in India and threatening to affect Afghanistan, Pakistan, Tibet, Nepal and Bhutan.

The phenomenon known as Glacial Lake Outburst Floods (GLOFS) are capable of releasing billions of cubic meters of glacial water, stored for decades, in a few hours, or even minutes without warning to those living downstream.

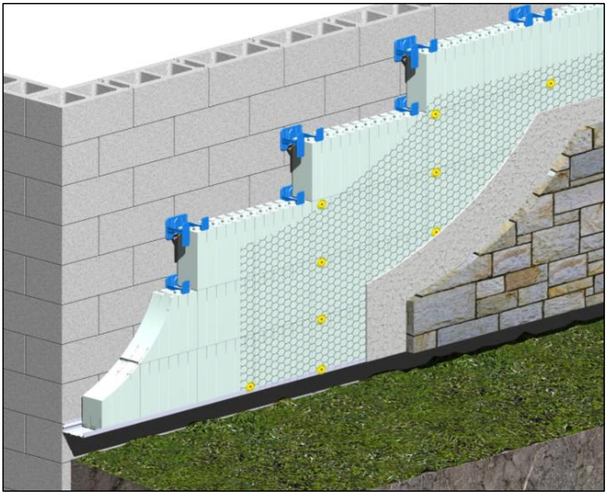
As a consequence of global warming, a combination of "rapidly melting Himalayan glaciers," extreme rainfall, and unpredictable seismic events are causing GLOFS in which massive waves of water suddenly charge down mountains wiping out entire communities.

What to do

Plan & Insulate your Buildings

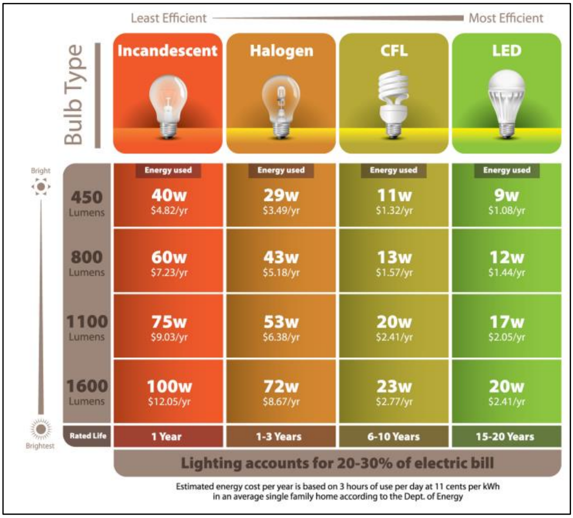
Architecture must correspond to current needs. Air and light must reach every nook and corner. Try to have at least two windows on separate walls of each room for cross-ventilation and maximum usage of sunlight.

Use thermal insulation materials to reduce the rate of heat transfer. Insulation ensures comfort as well as energy efficiency.



Use Energy Efficient Light Bulbs

Light Emitting Diode (LED) and Compact Fluorescent Light (CFL) bulbs have revolutionized energy-efficient lighting. They ensure less use of energy for giving more light. They are a bit expensive but do always remember that the electricity used over the lifetime of a single incandescent bulb costs 5 to 10 times the original purchase price of the bulb itself.

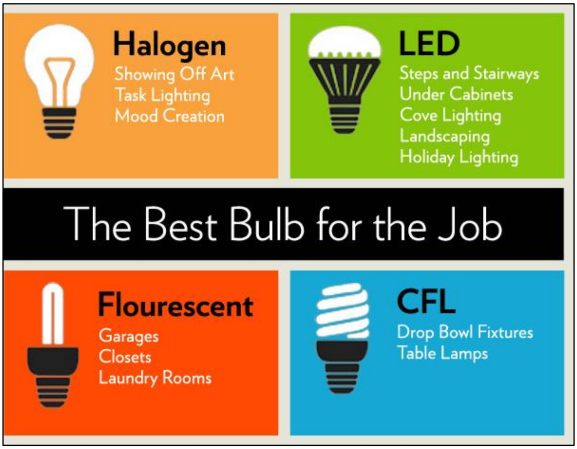


Least Efficient — Most Efficient

Bulb Type	Incandescent	Halogen	CFL	LED
	Energy used	Energy used	Energy used	Energy used
Bright 450 Lumens	40w $4.82/yr	29w $3.49/yr	11w $1.32/yr	9w $1.08/yr
800 Lumens	60w $7.23/yr	43w $5.18/yr	13w $1.57/yr	12w $1.44/yr
1100 Lumens	75w $9.03/yr	53w $6.38/yr	20w $2.41/yr	17w $2.05/yr
Brightest 1600 Lumens	100w $12.05/yr	72w $8.67/yr	23w $2.77/yr	20w $2.41/yr
Rated Life	1 Year	1-3 Years	6-10 Years	15-20 Years

Lighting accounts for 20-30% of electric bill

Estimated energy cost per year is based on 3 hours of use per day at 11 cents per kWh in an average single family home according to the Dept. of Energy



Use Energy Efficient Appliances

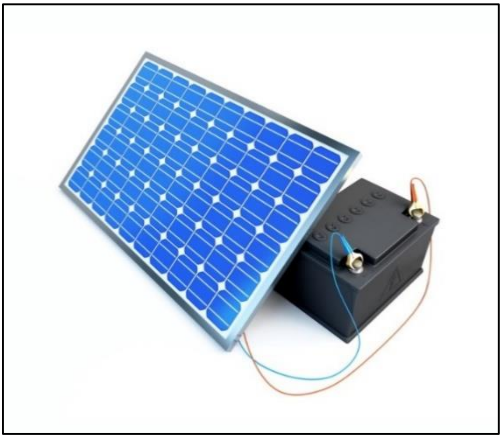
Try to find Energy Star logo on clothes washers and dryers, refrigerators, dishwashers and room air conditioners, etc., that you use. An appliance receives the Energy Star rating if it is significantly more energy efficient than the normal standard.

Turn off Appliances at The Power Points

Do remember that most electrical devices still use electricity while turned off, as they consume power even in a standby power mode.

Use Solar Panels to Generate Electricity

The price of environment friendly solar power, together with batteries for storage, has continued to fall so that in many countries it is cheaper than ordinary fossil fuel electricity from the grid.



Use Solar Geysers

Heat water without using any fuel or electricity; it avoids greenhouse gas emissions on one hand and saves money on the other.

Solar Geyser relies on warm water rising (natural convection) to circulate water through an evacuated glass tube collector and to the tank.

Use Clotheslines not the Dryers

To make your laundry completely eco-friendly, wash full loads of clothes in cold water using a non-toxic, biodegradable laundry detergent with a vinegar rinse, then hang your clothes out to dry in the sun.

Use Fuel Efficient Cars

Your first choice should be to use hybrid cars which have two or more distinct power sources to move the vehicle i.e. an internal combustion engine and one or more electric motors. Your second choice should be to use the most fuel efficient non-hybrid cars.

Walk or Ride a Bicycle

Besides reducing global warming, it will help you save money, burn fat and remain physically fit.

Use Public Transport

It helps eliminating travel that would have otherwise been made in a private vehicle. In other words, use of public transport means fewer vehicles, miles of travel, less consumption of fossil fuels and reduced greenhouse gas emissions.

Besides, it eases congested travel corridors; as a result, automobiles traveling in these same corridors achieve greater fuel efficiency.

Buy Local Food (Not Frozen)

Food coming from outside the town involves packing, shipping and shelf-life issues; it travels hundreds of miles to reach your dining table which means that buying local food prevents the burning of liters of fossil fuels.

According to an interesting study "if you're in New York and you buy a bag of pre-washed, mixed lettuce that's been grown in California's Salinas Valley, it takes 56 calories of fossil fuel energy to deliver 1 calorie of food energy to your plate. That is a very unsustainable way to eat, even if the lettuce is organic".

Eating local food also means getting aligned with Mother Nature by eating seasonally. Moreover, locally produced food is far better in terms of nutrition, taste and freshness.

Eat Less Meat

Some reports even suggest that greenhouse gas emissions produced by the global livestock industry are more than the emissions jointly released by all cars, planes, trains and ships.

Use Recycled Paper

By recycling a ton of recovered paper, 3.6 million metric tons of CO_2 emissions are eliminated. Recycling of recovered paper helps fight global warming in three ways:

1. If not recycled, about 80% of paper reaches landfills where it decomposes to produce methane. According to U.S. EPA landfills are the largest source of methane emissions because of the decomposition of paper therein.
2. If 100% of the paper is recycled, no cutting of trees shall be required to produce paper which means more trees shall be available to pull carbon out of air
3. Production of new paper by recycling the old one needs 50% less energy than manufacturing it from wood.

University of southern Indiana (United States) has published very interesting facts about paper recycling:

- To produce each week's Sunday newspapers, 500,000 trees must be cut down.
- Recycling a single run of the Sunday New York Times would save 75,000 trees.
- If all our newspaper was recycled, we could save about 250,000,000 trees each year!
- If every American recycled just one-tenth of their newspapers, we would save about 25,000,000 trees a year.
- If you had a 15-year-old tree and made it into paper grocery bags, you'd get about 700 of them. A busy supermarket could use all of them in under an hour! This means in one year, one supermarket can go through over 6 million paper bags! Imagine how many supermarkets there are just in the United States!!!
- The average American uses seven trees a year in paper, wood, and other products made from trees. This amounts to about 2,000,000,000 trees per year.
- The amount of wood and paper we throw away each year is enough to heat 50,000,000 homes for 20 years.
- Approximately 1 billion trees worth of paper are thrown away every year in the U.S.
- Americans use 85,000,000 tons of paper a year; about 680 pounds per person.
- The average household throws away 13,000 separate pieces of paper each year. Most is packaging and junk mail.
- In 1993, U.S. paper recovery saved more than 90,000,000 cubic yards of landfill space.
- Each ton (2000 pounds) of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4000 kilowatts of energy, and 7000 gallons of water. This represents a 64% energy savings, a 58% water savings, and 60 pounds less of air pollution!

- The 17 trees saved (above) can absorb a total of 250 pounds of carbon dioxide from the air each year. Burning that same ton of paper would create 1500 pounds of carbon dioxide.
- The construction costs of a paper mill designed to use waste paper is 50 to 80% less than the cost of a mill using new pulp.

Don't Use Plastic Bags (Use Fabric Bags)

Some of the facts about plastic bags and their impacts are as under:

- In USA, 12 million barrels of fossil fuels are used to manufacture 30 million plastic bags each year.
- An estimated one hundred thousand marine animals die each year from suffocating on or ingesting bags.
- Small pieces of plastic bags are accumulating at an alarming rate in oceans which is a great source of eco-system disruption.
- Plankton is a crucial source of food to many large aquatic organisms, such as fish and whales. In 2004, researchers found 6 pounds of plastic for every pound of plankton in the North Pacific Gyre. The number increased by 8 times within the next four years when in 2008, 42 pounds of plastic were found for every pound of plankton.
- Even when disposed of properly, plastic bags take about 450 years to decompose and pose a serious threat because of dioxin and other toxins.

Have one or Two Children at The Most

Less population means less need for energy and less burning of fossil fuels. Less population also means less Carbon dioxide emission in the process of breathing. Moreover, fewer children means better upbringing for them.

Plant Trees

Without trees life is not possible. Steve Nix, a US Forestry Expert gives a wonderful account of how trees help us:

- A mature leafy tree produces as much oxygen in a season as 10 people inhale in a year.
- Trees filter sewage and farm chemicals, reduce the effects of animal waste, clean roadside spills and clean water runoff into streams.
- Trees fight noise pollution. If planted at strategic points in a neighborhood or around your house, the trees can abate major noises from freeways and airports.
- Flash flooding can be dramatically reduced by a forest or by planting trees. One Colorado blue spruce, either planted or growing wild, can intercept more than 1000 gallons of water annually when fully grown. Underground water-holding aquifers are recharged with this slowing down of water runoff.
- To produce its food, a tree absorbs and locks away carbon dioxide in the wood, roots and leaves. Carbon dioxide is a global warming suspect. A forest is a carbon storage area or a "sink" that can lock up as much carbon as it produces.
- Trees help cleanse the air by intercepting airborne particles, reducing heat, and absorbing such pollutants as carbon monoxide, sulfur dioxide, and nitrogen dioxide. Trees remove this air pollution by lowering air temperature, through respiration, and by retaining particulates.
- Shade from trees reduces the need for air conditioning in summer. In winter, trees break the force of winter winds, lowering heating costs. Studies have shown that parts of cities without cooling shade from trees can literally be "heat islands" with temperatures as much as 12 degrees Fahrenheit higher than surrounding areas.
- During windy and cold seasons, trees located on the windward side act as windbreaks. A windbreak can lower

home heating bills up to 30% and have a significant effect on reducing snow drifts. A reduction in wind can also reduce the drying effect on soil and vegetation behind the windbreak and help keep precious topsoil in place.

- Erosion control has always started with tree and grass planting projects. Tree roots bind soil and their leaves break the force of wind and rain on soil. Trees fight soil erosion, conserve rainwater and reduce water runoff and sediment deposit after storms.
- Real estate values increase when trees beautify a property or neighborhood. Trees can increase the property value of your home by 15% or more.

Spread the Word

Learn more and more about global warming and its relation with disaster management. Tell others how their day to day actions are destroying mother earth and how they can help resolve the deadliest problem that the world is confronted with today.

Bibliography

1. 2011. *Framework on community based disaster risk management in Vietnam*. Vietnam: Joint Advocacy Networking Initiative in Vietnam (JANI), Centre for International Studies and Cooperation.
2. Gautam, Dhruba Raj. 2009. *Community based disaster risk reduction good practice*. Nepal: Kailali Disaster Risk Reduction Initiative, Mercy Corp.
3. Davies, Ian; Murshed, Zubair. 2006. *Critical Guidelines of Community Based Disaster Risk Management*. Bangkok, Thailand: Asian Disaster Preparedness Centre.
4. De Silva, Samantha; Burton, Cynthia. 2008. *Building resilient communities: risk management and response to natural disasters through social funds and community-driven development operations*. Washington, DC: World Bank.
5. 2011. *Training manual for disaster risk management systems at the community level – CBDRM*. Hanoi, Vietnam: Food and Agriculture Organization - UN and Red Cross.
6. Combaz, Emilie. 2013. *Community-based disaster risk management in Pakistan.* GSDRC Helpdesk Research Report 1028. Birmingham, UK: GSDRC, University of Birmingham.
7. 2009. *Good practices in community based disaster risk management*. GOI-UNDP Disaster Risk Management Programme 2002-2009. India: Government of India and United Nations Development Programme India.
8. 2008. *National Guidelines for School Disaster Safety*. Education for Social Cohesion Programme (ESC Programme). Colombo, Sri Lanka: Ministry of Education, Sri Lanka.
9. 2000. *School Earthquake Safety Guidebook*. British Columbia, Canada: Ministry of Education.
10. A Proposal for Disaster Management and Contingency Planning for Schools in Mumbai, Prof. Ravi Sana,

Department of Civil Engineering, Indian Institute of Technology Bombay.

11. Resource Pack, Disaster Preparedness and Response Education (DPRE) Working Group Pakistan, UNESCO.
12. Manual on ‘Community First Aid’, UNDP Pakistan and ADPC.
13. Manual on ‘Community Search and Rescue’, UNDP Pakistan and ADPC.
14. Brief on Earthquake Reconstruction & Rehabilitation Authority (ERRA)s, Islamabad.

"Asrar Ayyub is respected by the faculty and cherished overwhelmingly by the students for his profound understanding of the subject (Disaster Management) and articulate way of sharing it".

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Major General (Rtd.) Syed Usman Shah
Head of Department
Governance & Public Policy
National University of Modern Languages,
Islamabad

Mr. Asrar Ayyub is a noted disaster management and knowledge management practitioner, teacher, trainer and consultant.

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He teaches Disaster Management and Knowledge Management at various renowned universities and management institutes.

He also devised the curriculum for a post graduate diploma in disaster risk management which is being pursued at a renowned university in Pakistan.

Mr. Asrar Ayyub has also worked as a Disaster Risk Management Consultant for various national and international organizations.

He is a well-known and complimented columnist, poet, researcher; besides being the author of six published books.

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